The
Electrical Review

VOL. CX. MAY 27, 1932. No. 2844.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to E.R. (1930) LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Principal Contents:

	PAGE
Criticism from Canada	761
The Hackney Extensions	764
Granite Quarrying	765
An Industrial Change-over. By H. Williamson	767
Radio Measuring Instruments. By E. Banner	769
An Unsheltered Profession	771
Centenary of Sir Charles Tilston Bright	772
Motor-operated Bulkhead Doors. By C. Tupholme	773
Welded Steel Structures	774
Road Transport Problems	775
Rural Transformers	776
Correspondence:—Is the National Register a Failure?; E.H.P. Switchgear; Power in Industry; Earthing in Rural Areas; Power Factor Improvement; Shoddy Motor Winding; Earthing of Apparatus	777
The B.B.C.'s Latest Station	778
New Apparatus and Devices	779
Estimating and Profits	780
English Engineers and Canada	781
Business and Industrial Notes	782
Electricity Supply	785
Traction	787
Communications	787
Contract Information	788
Our Personal Column	790
New Companies Registered	791
Returns of Electrical Companies	791
City Notes	791
Stocks and Shares	793
Published Specifications	795
New Work for Contractors	796

Criticism from Canada

ENGINEERS and others from the Home Country who take up positions in Canada or pay prolonged visits thereto nearly always express astonishment and regret at what seems to them to be indifference on the part of British electrical manufacturing and other authorities to the great potentialities of that vast market.

The theme is almost as old as British electrical export trade. It has been explored from every conceivable standpoint by experts and by organisations, and argument and information have been placed before readers of the ELECTRICAL REVIEW by scores of authoritative observers until it might be supposed that there was really nothing new to say and that the reiteration of old advice was useless. But with world affairs in the melting pot, who can imagine that the last word has been said about anything? At Ottawa many things will be said over again, but amid changed conditions.

This week our Canadian Correspondent returns to the subject, quoting criticisms advanced by an English professor at the University of Toronto, who has been writing on Canada as a possible market for British mechanical engineering products. Though directly the exponents of electrical questions, we recognise that our mechanical engineers should be interested in the vast hydro-electric enterprises characteristic of Canadian development. It is strange, therefore, that the views expressed are similar to those that have been advanced regarding purely electrical work.

This equal interest of electrical and mechanical engineers in the execution and conduct of big enterprises has moved our Canadian Correspondent to renew his own suggestive criticisms. The Americanisation of Canada continues; the habit of turning to the States and adopting American methods and American equipment has not been checked. The writer points to the awakening of British mechanical engineers as evidenced by the arrangement made by the Institution of Mechanical Engineers for a number of its members to visit Canada in August next; they will be in Toronto while the Canadian National Exhibition is running.

He therefore not unreasonably asks why the Institution of Electrical Engineers cannot organise a similar visit enabling members who so desire, to see the many great things of electrical engineering interest in a part of the British Empire which promises to provide development and trading work for long years to come.

Recent electricity supply developments in this country bring Home and Canadian practice into closer resemblance. This fact, along with a number of others, seems to indicate that a few weeks' observation at close quarters, and closer contact established between electrical engineers from both fields, would yield valuable interchange of ideas and afford experience capable of being turned to good account in future electrical development works throughout the Empire.

The question is raised at an appropriate moment, for the I.E.E. holds its Harrogate summer meeting next week. The suggestion is made by one who feels that the Institution has neglected the Dominion; that its members are forgotten after they settle in Canada; that, as English members, they have no means of keeping in touch with fellow members either here or there; and that the consequent tendency is for them to drift over to the American Institute.

No doubt the Institution, which has members all over the world, can make a good reply, but we place the criticisms and suggestions on record. Possibly it is not even now too late to arrange for a contingent of "Electricals" to accompany the "Mechanicals" this year!

The way will then be left clear for either the I.E.E. or E.D.A. to give the lead for a big National Electrical Convention to be held in this country next year in place of the usual three separate summer gatherings.

Boiler Control

THE importance of the Hackney generating station in the South-East England Scheme may be gathered from the fact that the output estimated to be required by the C.E.B. in 1932-33 will be 51 million kWh (31,000 kW of m.d.), and in 1933-34, 74½ million kWh (51,000 kW). The "Kent" system

of automatic control (entirely British in design and execution) that has been adopted by Mr. Robinson is therefore significant. It impresses us for three reasons. The first is that it has always seemed to us wrong to pay so much more attention to the skilled control of the electrical than of the steam end; although in recent years much has been done to correct this tendency, Hackney, as far as we are aware, provides the first instance of a control-room in which the state of affairs in the boiler-house can be seen at a glance. Secondly, automatic control is so valuable a feature in the use of electricity in industry that a signal demonstration of its effectiveness in a generating station will provide a good example of what electricity can do. Finally, even if no substantial economies are achieved by the present installation (and the 13 per cent. CO_2 obtained without appreciable CO appears to indicate that economies will result), the value of the technical information gained will be great. Mr. Robinson proposes to obtain comparative results by running the boilers sometimes on manual control.

Electrical Jubilees

THIS is a year of Jubilees in British electrical industry. One leading cable manufacturing company has recently held its celebrations. Early next month the jubilee of the first storage battery concern in the world to manufacture on a commercial scale—the old Electrical Power Storage Company, which made lighting and traction accumulators at Millwall—marks the completion of its fiftieth year with a two days' programme, particulars of which appear in our later pages; and in the late summer or early autumn another company, bearing a name always famous within the memory of most of us, likewise closes its first half-century, for it was in September, 1882, that the incorporation of Ferranti, Thomson and Ince took place. Other electrical jubilees have preceded these, and still others cannot be very far off, while THE ELECTRICAL REVIEW, whose privilege it has been to record the birth and development of all, itself completes its sixtieth year in November.

Electricity in Quarrying

MUCH useful electrical load is awaiting development in all kinds of quarries in many parts of the country—haulage, traction, crushing, grading, drilling, etc.—some of which operations are depicted in the description this week of the Mountsorrel Granite Quarries. Many workings have comparatively short lives, and careful consideration is necessary to ensure return of capital expenditure on equipment. The possibilities of moving an installation from one quarry to another depend on standardisation both of supply and apparatus. It is held in some quarters that as long as electricity is used for driving the air compressor it is of little importance whether pneumatic or electric drills are used. We think that where as good or a better job can be done wholly electrically that method should be advocated.

Cornish Tin Mines

THE closing down of tin mines naturally had a serious effect upon the business of the Cornwall Power Company last year. Its output declined by nearly 50 per cent., despite the fact that the sale in bulk to distributing undertakings advanced by 47 per cent. Sustained recovery of the industry, as Mr. P. D. Tuckett told shareholders of the Urban Electric Supply Co. last week, can hardly be expected until the price of the metal rises substantially; it has fallen from about £400 per ton in 1918 to £125 to-day. The producers' drastic reduction scheme recently brought about an advance, and if the improvement continues until £200 per ton is reached Cornwall will benefit materially, and with it the Power Company. It is stated that the power used in a single mine in full working exceeds the total consumption of all the distributing undertakings; therefore it is not possible in a short space of time to build up a stable load from the latter to compensate for an unreliable or lacking mining load, though efforts to that end are, of course, being made.

The First Atlantic Cable

ONE hundred years ago Britain gave birth to a son who at a very early age achieved lasting fame by laying the first deep-sea telegraph cable. Sir Charles Tilston Bright established telegraphic communication between the two worlds. Scientists have showered wonderful discoveries upon the human race since then, affecting nearly every department of life, but the story of the achievements of Bright and the other pioneers of the telegraph will ever stand out impressively upon the pages of the Early Victorian era. In the record of Sir Charles's part therein, which is briefly told in this issue, THE ELECTRICAL REVIEW pays tribute to his "vigour, earnestness and enthusiasm" (words of Lord Kelvin, who was associated with the enterprise). He proceeded with the undertaking "when other engineers would not look at it and thought it absolutely impracticable."

The Value of Experience

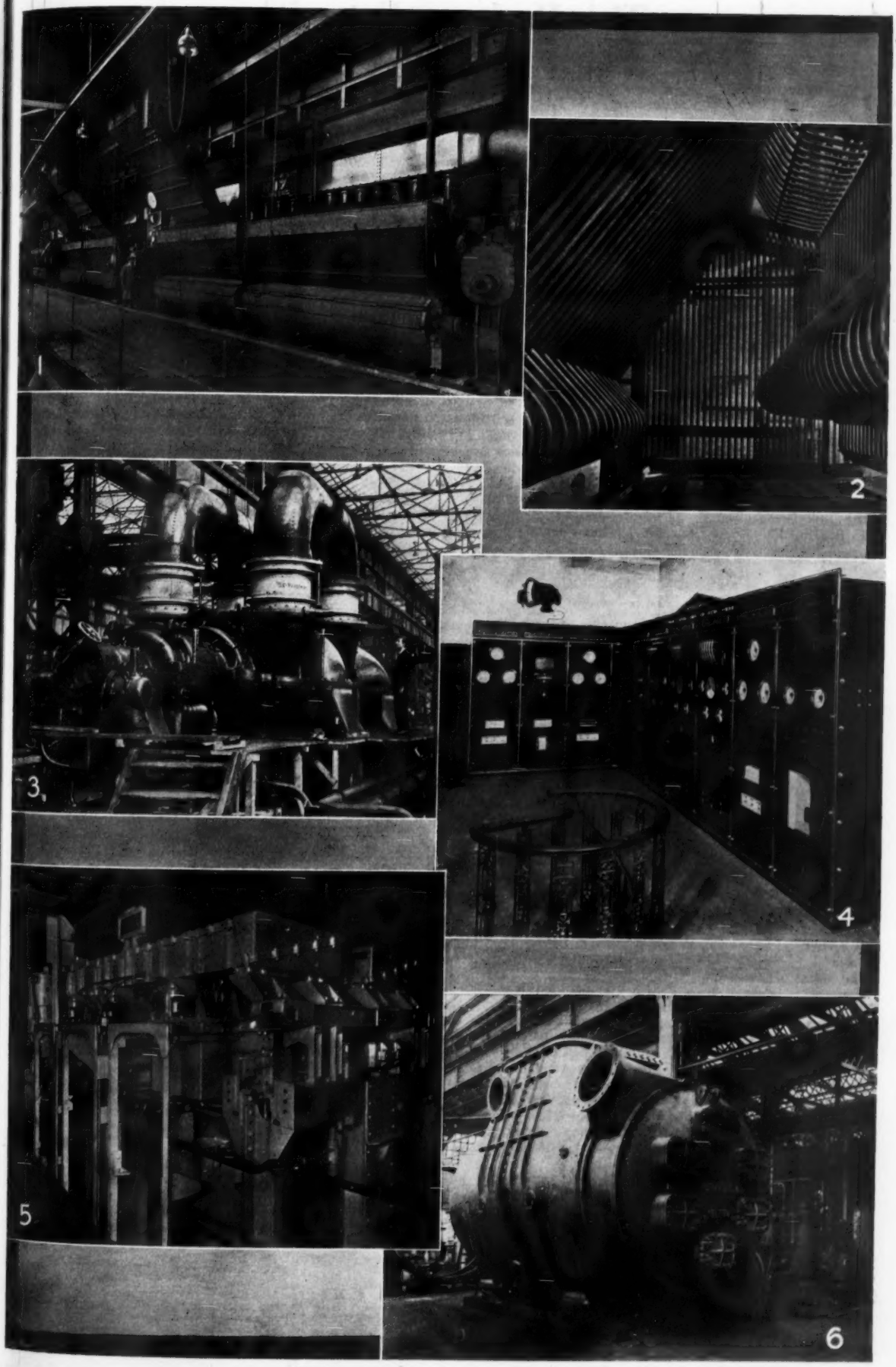
IN his presidential address to the Institution of Mining and Metallurgy, Mr. Sydney W. Smith referred to the need to review our resources not only in minerals but also in experience of men who have been close to practical problems. The value of experience is exemplified in our own profession where the men directing it have not the advantage that belongs to more static industries of having learned most of the fundamentals of their work in their mentally more receptive youth. Events in the electrical sphere have progressed so rapidly during the last quarter of a century that it has been difficult to keep abreast of the newest developments while carrying on the daily task. But discussions at the I.E.E. and other places show that it has been done—another indication of the truth that it is the busy man who most easily finds time to do what has to be done.

Electric Baking Ovens

IN an article by Mr. G. H. Leak published in our issue of April 3rd, 1931, attention was drawn to the long life of fuel-fired ovens, the implication being that an opportunity to electrify an oven, if lost, was not likely to recur for a long time. The report of an official inquiry into an explosion "of a violent nature" in a steam-heated oven in Bristol shows that the oven had been taken over by its present owners in 1915. Any information as to when it was built is seemingly lost in the mists of antiquity. This explosion draws attention to an advantage of electricity for bread-making that has not often been emphasised—its relative safety and reliability. The electrical heating elements—which correspond with the steam pipes—are run at a low temperature, and failures, which are harmless in any case, are exceedingly rare.

The New Fulham Station

IT is now nearly eighteen months since the inquiry into the application for consent to the erection of the 120,000-kW generating station at Fulham was held by the Electricity Commissioners. Many questions of the first technical importance were then raised, including those relating to the limitations of the principle that capital stations should be laid down at points removed from the load centres and to the method of dealing with chimney emissions. Three tenders, aggregating nearly £600,000, have now been recommended for acceptance. These comprise the offers of the Met-Vick for the two 60,000-kW turbo-alternators at £2.18 per kW; the Stirling Boiler Co. for three boilers fitted with Erith-Roe stokers and three fitted with Taylor stokers at about £3 per kW, providing a good opportunity to compare the operating features of the two types under identical steaming conditions; and Ferguson, Pailin, Ltd., for feeder switchgear.



The Extensions at Hackney

1. Front view of boilers, showing stokers and travelling coal chutes. 2. Combustion chamber of one of the boilers during erection. 3. The 30,000-kW turbine under construction. 4. Control room showing boiler-control panels. 5. Some of the high rupturing capacity switchgear. 6. Condenser to deal with 260,000 lb. of steam per hr.

D

The Hackney Extension

Automatic boiler control is a prominent feature

ON Tuesday we took an opportunity of inspecting the new 30,000-kW plant installed by Mr. L. L. Robinson, borough electrical engineer, Hackney, at his Millfields Road generating station.

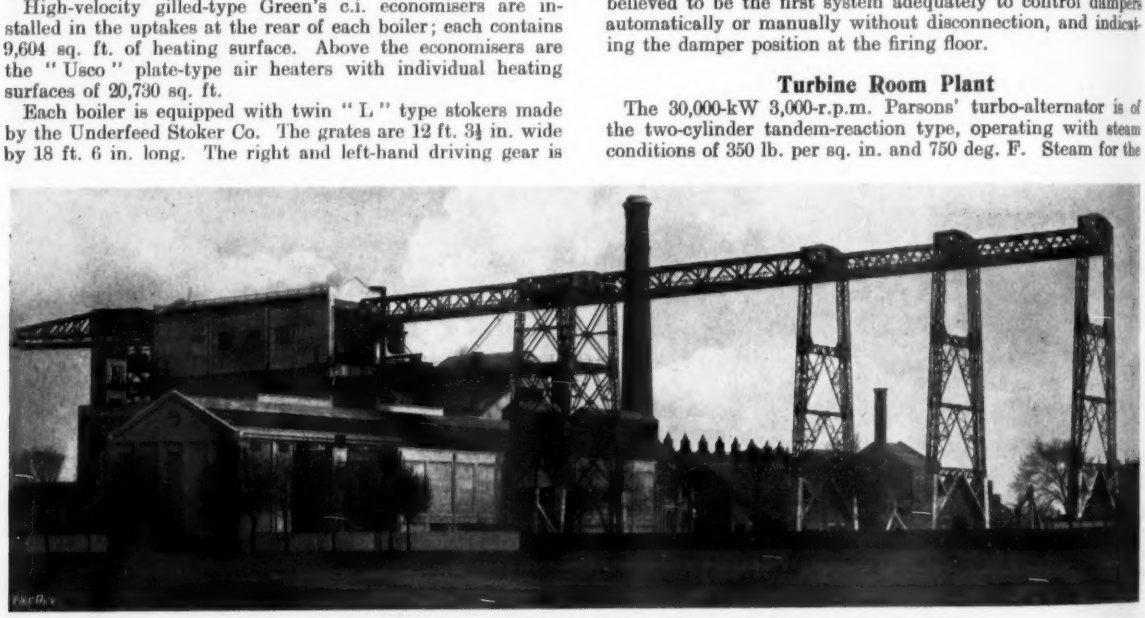
The addition to the boiler house contains three Simon-Carves tri-drum boilers with completely water-cooled combustion chambers. The capacity of each is 125,000 lb. per hr. normal and 150,000 lb. maximum from feed entering the economiser at 260 deg. F., with steam conditions of 400 lb. per sq. in. and 800 deg. F.; the heating surface of each is 18,635 sq. ft., of which 2,513 sq. ft. provides radiant heat absorption.

The walls, arches, and roof of the combustion chamber are formed of tubes covered by refractory tiles; the pipes for feeding the front wall and stoker arch form the furnace sides at fire level, thus acting as anti-slag headers.

The heat release in each chamber (including heat in the preheated air) is 28,300 and 35,340 B.th.u. per cu. ft. per hr. on normal and maximum ratings, respectively. The M.L.S. superheaters have each an effective heating surface of 5,500 sq. ft., half of the elements being mingled with the generating tubes in the front bank.

High-velocity gilled-type Green's c.i. economisers are installed in the uptakes at the rear of each boiler; each contains 9,604 sq. ft. of heating surface. Above the economisers are the "Usco" plate-type air heaters with individual heating surfaces of 20,730 sq. ft.

Each boiler is equipped with twin "L" type stokers made by the Underfeed Stoker Co. The grates are 12 ft. 3¼ in. wide by 18 ft. 6 in. long. The right and left-hand driving gear is driven by variable speed 3¼-h.p. motors direct coupled to the first reduction; 24 speeds, between 400 and 1,200 r.p.m., are provided. Ashes are delivered into hydraulic sluicing canals connected to a large sump.



Exterior view of Millfields Road generating station, showing coal and ash transporter

Mechanical Draught

The forced- and induced-draught Musgrave fans (one set for each boiler) are situated on the boiler-house roof. The induced-draught fans are driven by 240-h.p., 550-920 r.p.m. "Emcol" motors, giving 4 in. and 7¼ in. w.g. suction at normal and maximum loads; they discharge to the chimneys through Davidson shunt pressure cyclone grit catchers. The forced-draught fans are driven by 150-h.p., 500-870 r.p.m. motors, and give 2½ and 3 in. w.g. at normal and maximum loads. Ten Parry steam soot blowers are provided for each boiler and two for each economiser.

A different coloured paint is employed for each service of piping. Spencer welded joints are used on the high pressure range and all the valves are Hopkinsons'. A Crosby thermostat-controlled de-superheater reduces the steam temperature to 600 deg. F. to suit the old plant, for which Crosby relay-operated multiple-reducing valves can pass 125,000 lb. of steam at 200 lb. per sq. in.

The feed system consists of two 7-in. mains extending from the bled-steam feed heaters in the turbine room to the remote end of the boiler house. The 7,000-gal. tanks for soft and hard water are erected on steel structures above the boiler-house roof. They are fed by 2,500-g.p.h. Rees-Roturbo pumps.

There are three coal bunkers located over the central bay of the boiler house with an aggregate capacity of 2,000 tons. They are supplied by duplicate 50-ton transporters and 3-ton Priestman grabs. An Avery totalising weighing machine is provided in each track where it passes through a steel tower erected adjacent to the wharf. Each boiler is also equipped with an Avery 6-cwt. automatic weighing machine.

Boiler Control

The "Kent" system of centralised electrical boiler control is designed to supply the correct amount of fuel and air to meet the demand with the requisite load distribution among the boilers.

A master controller measures the amount and rate at which the steam pressure changes in the main range and alters the draught on the three boilers simultaneously. A furnace-pressure regulator (independent of the main controller) for each boiler maintains at a constant value (irrespective of fuel-bed resistance) the suction in the combustion chamber by varying the output of the forced-draught fan. An independent fuel/air ratio controller preserves a balance between air supplied by the forced-draught fan and the grate speed by varying the speed of the latter.

The damper gearbox is an accessory of the master controller and furnace-pressure regulator and allows remote operation of either the forced-draught or induced-draught fans. It is believed to be the first system adequately to control dampers automatically or manually without disconnection, and indicating the damper position at the firing floor.

Turbine Room Plant

The 30,000-kW 3,000-r.p.m. Parsons' turbo-alternator is of the two-cylinder tandem-reaction type, operating with steam conditions of 350 lb. per sq. in. and 750 deg. F. Steam for the h.p. cylinder is led by overhead pipes to the centre of the l.p. cylinder. The guaranteed heat consumption at the most economical rating (24,000 kW) is 11,080 B.th.u. per kWh, giving a thermal efficiency of 30.79 per cent.

Steam is bled from the turbine to heat the feed water. The condenser, designed to deal with 260,000 lb. of steam per hr., was built by Hick, Hargreaves & Co., Ltd.

The 6.6-kV alternator, which is the heaviest part of the machine, weighs over 85 tons, including rotor. Its casing is of electrically welded mild steel.

Iron-clad Switchgear

The new switchgear is of the Reyrolle vertical drop-down double bus-bar type. It comprises the following panels: Six 4,000-A (one generator, two grid-transformer, two bus-bar reactor, and one section), two 2,000-A interconnector (to existing switchgear through reactors) and six 800-A feeder. To facilitate change-over from one bus bar to the other without interruption of supply duplicate circuit breakers are provided, except on the bus-bar coupler and the feeder panels. Three cylindrical tanks are used per breaker. The rupturing capacity is one million kVA.

Interlocking mechanism prevents either of the breakers being closed while the cable is earthed; earthing is by means of cam-operated switches housed within the oil-filled current-transformer chambers.

The three main contractors were: Simon-Carves, Ltd., boiler-house buildings, foundations, and plant (including telpher-coaling and ash-handling gear); C. A. Parsons & Co., Ltd., turbine-house plant and auxiliaries (including feed pumps and feed heaters); A. Reyrolle & Co., Ltd., switchgear and control boards. The extension will be formally inaugurated by Prince George on June 23rd.

GRANITE QUARRYING

Electric crushing, haulage and pumping

BECAUSE quarrying generally is an industry in which not nearly full advantage has been taken of electric driving, &c., the opportunity to visit the well-equipped quarries at Mountsorrel, Leicestershire, of the Mountsorrel Granite Co., Ltd., was particularly welcomed. Although these works are not all-electric, electricity is used very extensively for crushing, haulage, and pumping, and there is evidence that the change-over to the modern drive has been and is being carried out progressively.

Energy is received from the Leicestershire and Warwickshire Electric Power Co. at 440 V, three-phase, being transformed down on site from 11,000 V by the Power Co. A total of 1,291 h.p. is given by thirty-one motors, varying in size from one to 200 h.p. Overhead-line circuits convey the energy to various points in the workings.

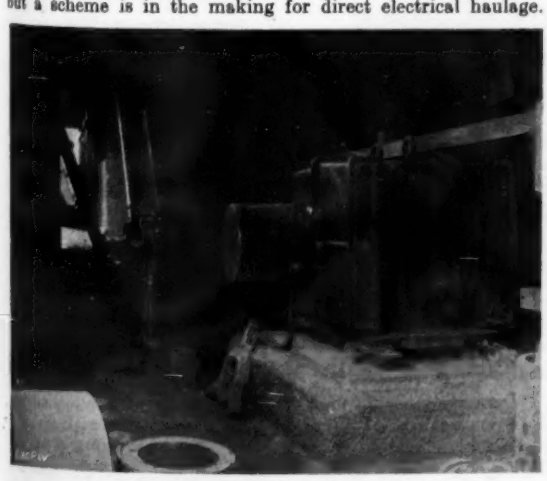
Preliminary Breaking Up

The granite at Mountsorrel is believed to be the only pure material available, and it is of igneous (volcanic) origin. The main quarry, which now has three levels, giving in each case 50 ft. of working face (depth), was originally a hill, and has been worked for 100 years. There is still practically an unlimited supply of rock, so that the question of the life of the quarry does not in this case arise.

Holes are drilled by compressed air in the granite to a depth of 20 ft., and then charged for blasting. Up to 2,000 tons of rock may be brought down by one charge. The larger pieces are reduced to "hammer" size by secondary blasting. After being "knocked up" by quarrymen to sizes suitable for the crushers, the material is loaded into wagons and taken to the mill bank, where it is fed into primary crushers. These reduce it to a maximum size of 3 in., and the whole product is then screened and the larger sizes are conveyed to secondary crushers which make saleable sizes from 2½ in. down to sand.

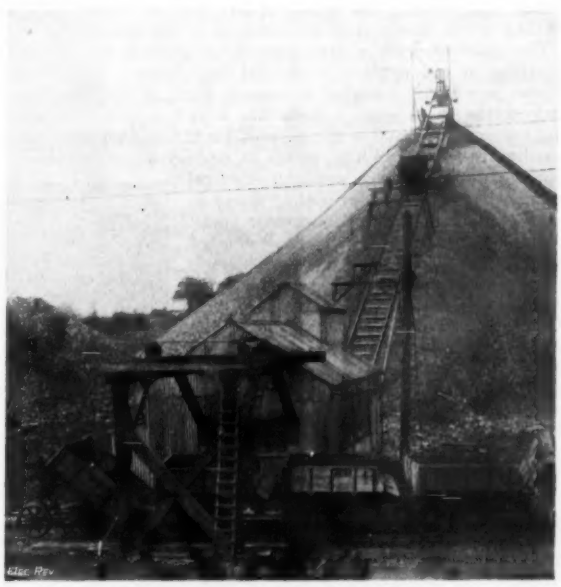
Crushing and Sorting

The whole plant is capable of dealing with 800 tons of saleable product per day of 8½ hours. At present the material is taken from the quarries to the mills by steam locomotives, but a scheme is in the making for direct electrical haulage.



Secondary crushing unit (75-h.p. motor)

There are four primary crushers arranged in pairs, each pair feeding one set of rolls, the product from which gravitates to a primary screen. These four crushers, two sets of rollers, and two screens, are all driven by a 200-h.p. "No-Lag" motor, which not only runs at a high power factor, but corrects that of the whole installation. At the time of our visit the main p.f. meter was registering 0.85—an exceptionally good figure for the very varying load conditions prevailing, and one not often obtained in the ordinary industrial works without correcting apparatus.



Sky tip served by electric haulage

Rejects from the primary screens are dealt with in a "smalls" plant, consisting of one crusher, one set of rolls, one primary screen, and two grading screens. This plant will deal with up to 16 tons per hour, and is driven as one unit by an 80-h.p. synchronous motor. The product (other than the rejects) from the primary screens is conveyed to a pair of grading screens, which, with the conveyor, are driven by a 60-h.p. slip-ring motor. This equipment will deal with 80 tons of saleable product per hour. From the grading screens the larger sizes of the material are taken to one or another of the smalls units mentioned below.

Dealing with Smalls

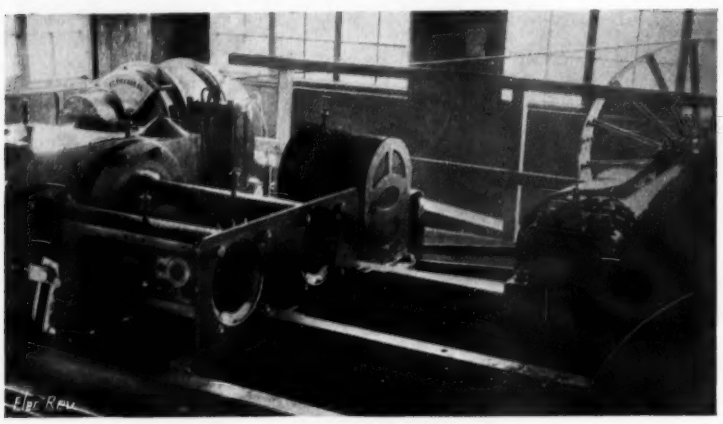
One equipment, comprising a set of rolls and grading screens is driven by a 50-h.p. motor and has an output capacity of 16 tons per hour. A second unit with the same capacity consists of two crushers and a large grading screen; this also has a 50-h.p. synchronous motor drive. Another plant with three crushers, one set of rolls, and two grading screens, is served by a 75-h.p. slip-ring motor with short-circuiting gear; its capacity is 21 tons per hour.

There is also a stand-by plant for dealing with smalls when required. It has two crushers, one set of rolls, and

two grading screens, all driven by a 60-h.p. s.r. motor with short-circuiting gear. According to the sizes required this unit will deal with from 12 to 16 tons per hour.

Dust Collectors and Pumps

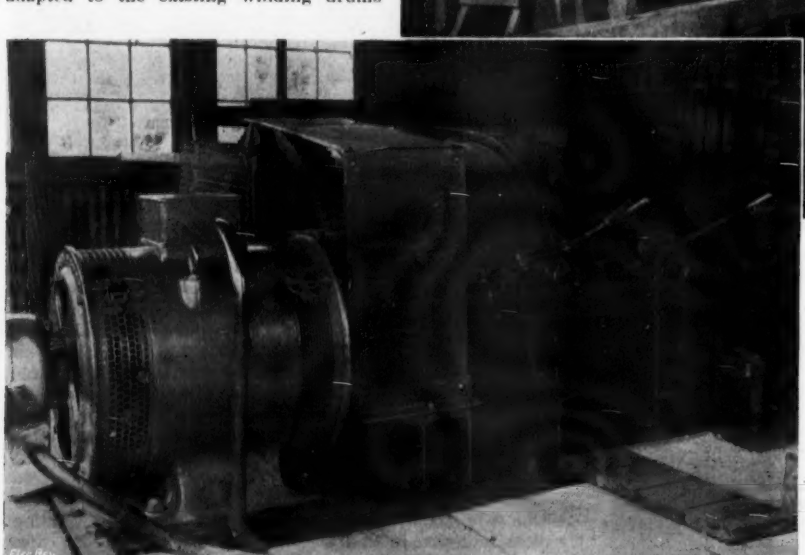
Efficient dust-collecting apparatus is in service in the mill. Dust is collected at many points, and the whole system is served by a 35-h.p. motor. In a week of about 36 hours five tons of dust may be collected by this plant. An additional collecting unit, in course of erection, is to be driven by an 18-h.p. s.c. motor. The whole of the dust is delivered to a settling house where it is subjected to a wet process.



Converted haulage winder for the main quarry

The quarries drain a very large area of land, so that the pumping in bad weather is of vital importance. Electrically driven pumps are installed at several parts of the workings, and in the main quarry there are a 10-h.p. pump serving the bottom level, and a 16-h.p. unit for the middle level. At another quarry a 16-h.p. pump is employed for about six hours per day in bad weather. Several small pumps are used for cooling water in connection with the air-compressor plant.

Haulage up the mill bank is all effected electrically. There is a point of historic interest about the 60-h.p. s.r. motor drive working an incline in the main quarry. This was originally a steam drive, and when the crankshaft failed one Friday it was immediately decided to convert to electric drive. The Brush Electrical Engineering Co., Ltd. (near at hand at Loughborough), had a suitable motor and starting gear in stock, and this motor was adapted to the existing winding drums and put into service by the followig Wednesday. The illustration shows part of the old steam set still in position.



Winding equipment for the Blondin aerial ropeway

A 50-h.p. haulage motor serves an incline at another quarry. Replacing a steam locomotive, a 60-h.p. electrically driven main and tail haulage equipment was installed some eighteen months ago, while a 35-h.p. motor-driven m. and t. system is used for hauling railway wagons to and from hoppers for supplying road transport. This latter unit is very efficient; a 10-ton lorry can be loaded in five minutes, including time for weighing.

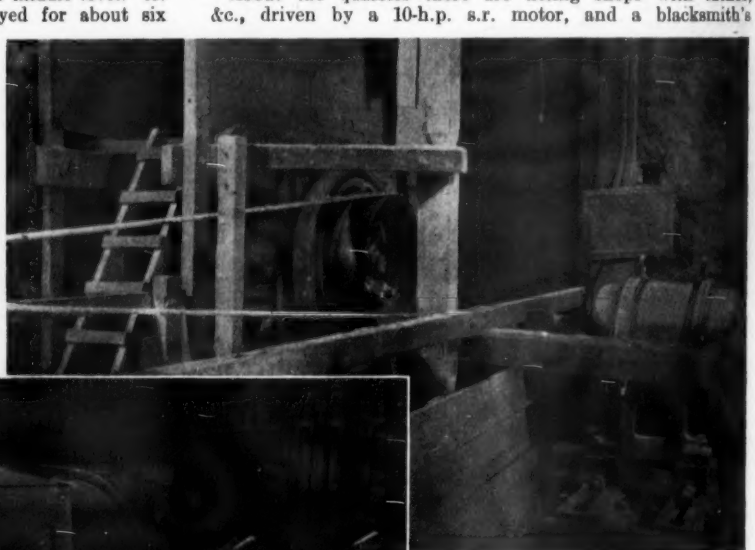
All the product from the top level of the main quarry is hoisted by a Blondin-type aerial ropeway, 880 ft. span, and transhipped to main-line wagons. This unit is operated by a 70-h.p. s.r. motor, and it will deal with 250 tons of material per day (eight hours). The maximum load, including the carrier, is 3 tons 5 cwt.

There is much unsaleable product (overburden and rammel) from the quarries to be disposed of, and electricity plays an important part in the engineering task of dumping the maximum of waste in the minimum area. The material is taken in wagons from the quarries to a 50-ton hopper at the foot of a tip, for loading into the tip wagon. The dirt is tipped on a gradient of 30 deg., being hoisted by a 150-h.p. s.r. motor. One man controls the loading of the tip wagon, which closes and opens automatically at the required positions, and he and the haulage attendant can between them handle upwards of 240 tons of dirt and waste material per day.

Automatic Operation

The distinctive feature of this equipment is that the whole operation is automatic, from the locomotive leaving the train on the loop. The winding gear has two drums, a main one for hauling the wagon up the tip and a smaller one for hauling the wagons from the loop and tipping them into the hopper. It is estimated that the tip will eventually be 250 ft. high, with a consequent spread of 500 ft.—an excellent achievement.

About the quarries there are fitting shops with lathes, &c., driven by a 10-h.p. s.r. motor, and a blacksmith's shop with ten fires and a carpenter's shop with various woodworking machines, all driven by a 40-h.p. s.r. motor.



50-h.p. drive for the "smalls" plant

The heavy mill equipment necessitates very heavy belt drives, and this explains the use of the large s.r. motors with short-circuiting gear. Star-delta starters are employed for most of the smaller s.c. motors, and liquid starters for the winders.

Practically all the motors we saw were of B.T.-H., Brush & Crypto makes.

The company is remodelling the system from the use of 60-W to larger lamps of from 150 to 300 W on grounds of economy. One large lamp replaces more than the equivalent wattage of the smaller ones. "Maxlume" (Veritys) reflectors are employed.

An Industrial Change-over. By H. Williamson, A.M.I.E.E.

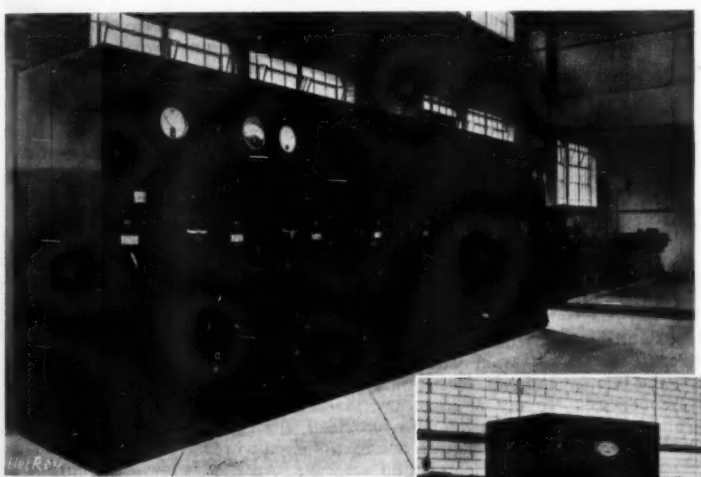
A combined amalgamation, extension, and conversion scheme

THE supply and distribution of electricity for a large works is seldom a straightforward matter, but when changes of voltage and frequency are added to the complications arising from special internal conditions the problem assumes formidable proportions.

Late in 1928, Messrs. Henry Wiggin & Co., Ltd., Birmingham, inaugurated a large extension scheme for which they acquired all the property separating their two existing works situated at opposite ends of Wiggin Street. The two works received individual supplies from the Birmingham electricity undertaking and were treated as separate consumers.

Upon the merging of the properties it became evident that the supply and distribution of power from one central sub-station would be desirable. To meet the supply authority's requirements the main incoming panels had to be as near the street as possible, and it was also desirable to get as near as possible to the electrical centre of gravity. Entrances and exits to and from the site also affected the situation of the sub-station. Then came the real problem—foreseeing the demand and conditions to be met by the distribution centre when the whole scheme would be complete, say, five years ahead.

The factors which had to be considered were the normal expansion of demand from the existing plant; the developing and future requirements of the extension scheme; the separate metering of energy for furnace and power loads in order to take full advantage of the reduced furnace-load tariff; the distribution of electricity for lighting, heating and cooking; limiting capital expenditure on plant required to meet heavy peaks and inherently low load factors; wide variation of power between adjacent units, that is, large motors sparsely distributed over wide areas and served by satellite machines requiring little power; and the necessity of maintaining supplies to certain vital processes, such as melting valuable metals and alloys.



A further consideration was the fact that about the time the extensions approached full production the supply from the mains would be changed from 5,000 V, 25 cycles, to 11,000 V, 50 cycles, which would necessitate the replacement of about 200 motors and 15 transformers in the two older works.

The use of e.h.p. motors and secondary e.h.p. sub-stations at various points was considered and discarded, and it was decided to adopt a secondary voltage of 400 throughout the works.

"Scientific Guesswork"

The estimating of the power requirements necessitated a considerable amount of "scientific guesswork"; one difficulty was to avoid the future reproach of inadequate provision without incurring the immediate displeasure of those who had to sanction the expenditure.

There followed a long series of attempts to forecast the ultimate requirements. The present demand of the two older works is roughly 1,000 kVA each, and an increase of 50 per cent. has been allowed for each. The extensions had to embody the plant for making spoon and fork blanks, then situated in another district, as well as all the new plant for casting ingots, machining them, forging them into billets—for strip and sheet mills—fettling plant comprising a large number of pneumatic chipping hammers, and the large and complicated universal and sheet mills.

In addition, one high-frequency electric furnace had to be transferred from the existing works at the north end of the street, and a second, larger Heroult electric furnace from a works in another part of the town. These, with a new Heroult furnace, are to be concentrated in the melting shop. A third Heroult furnace now in the northern works has to be transferred to the anode casting shop.

The requirements of all this plant were estimated at 6,000 kVA. The two main divisions are furnace and power loads, 2,400 and 3,600 kVA, respectively, and these are sub-divided into circuits A-Z (see schematic diagram). The bus bars are divided into four sections, on each of which it is estimated that there will be a demand of about 1,500 kVA, allowing for load and diversity factors.

The motors in the extensions presented the next difficulty. Should they be 25 or 50 cycles, or dual frequency? The adoption of 50 cycles raised a crop of fresh difficulties, and rendered necessary a frequency changer. But the output of the frequency changer had to be specified before the machine could be requisitioned. The factors that decided the output of 1,500 kVA were the amount of plant in the extensions that might be in operation before the revised supply became available, and the load factors of the larger consuming units.

Negotiations with the Central Electricity Board were quickly and amicably settled, and the provision of a motor-alternator set was agreed on. The motor receives a supply at 5,000 V, 25 cycles, and the alternator delivers to the bus bars at 400 V, 50 cycles.

Distribution of Power

This set and the whole of the control gear were made by the Metropolitan-Vickers Electrical Co., and the machines are of the synchronous type and of fabricated construction. The alternator delivers current through a 3,000-A circuit breaker to a special connection chamber at one end of the bus bars of the low-pressure distribution board.

Current at 5,000 V, 25 cycles, from the mains had to be provided and metered to the frequency changer, and to a lighting transformer for the new works as they were brought into use.

(Left) E.h.p. distribution board, and lighting transformer and switchgear (Right) Power switchgear; note bus couplers, blanks for future breakers, and cable trench

At a later date the supply will be 11,000 V, 50 cycles, and it must then be delivered and metered separately to power and furnace sections; consequently the e.h.p. board must be capable of taking additional panels at each end, these panels feeding the transformers that will ultimately meet the total demand of 6,000 kVA.

The main power transformers will not be installed until nearer the time for the change of frequency. The lighting transformer, however, had to be put in at once, consequently it was made of the dual-voltage and dual-frequency type, having a present capacity of 250 kVA with a capacity of 500 kVA after the change over.

The low pressure side presented further difficulties, for not only had it to meet the future requirement of separate power and furnace circuits, but it also had to be capable of providing energy for any part of the extension scheme at once. Moreover, it had immediately to be fed throughout its length from the frequency changer and yet be capable of being sectionalised and fed at four points from the main transformers when installed.

Since most of the circuit breakers would not be required until the change over and the coupling up of the older works

the factor of locked-up capital assumed serious proportions, and it was therefore decided to design the board so that further breakers could be added as and when it was considered necessary.

In order to accommodate the very heavy cables, exceptionally wide and deep cable trenches were provided, and this again demanded a special design of legs and feet for the board.

The whole of the switchgear, both e.h.p. and l.p., in the sub-station was made by Messrs. George Ellison, Ltd., and it has been generously proportioned throughout. The main bus bars are capable of division by four bus couplers with slow-break, non-automatic oil switches that can be locked in or out; they will never be opened or closed under load. For the period prior to the frequency change all the couplers are locked in the closed position, so making the bus bars one continuous length. Current from the frequency changer is fed to the bars at the "Z" end.

Adjoining each of the bus couplers is a chamber designed for the subsequent insertion of four non-automatic oil switches, each controlling the secondary side of one of the four 1,500-kVA transformers to be installed. At present these chambers are mere cells, the gap in the bus bars being bridged by copper link bars.

The immediate requirement of continuous bars fed from one end and the future demand of discontinuous bars fed from four points are met by this simple arrangement. Moreover, should one transformer fail, its section of the bars could be coupled to either of the adjacent sections, and selected and vital processes be supplied.

Then came the division of the components of the total load into four groups which, when load and diversity factors are taken into account, should be approximately equal. Since power and furnace loads had to be grouped separately, roughly one half of the board had to be allocated to each. The result was that circuits A to O inclusive were allotted to furnaces and P to Z inclusive to power.

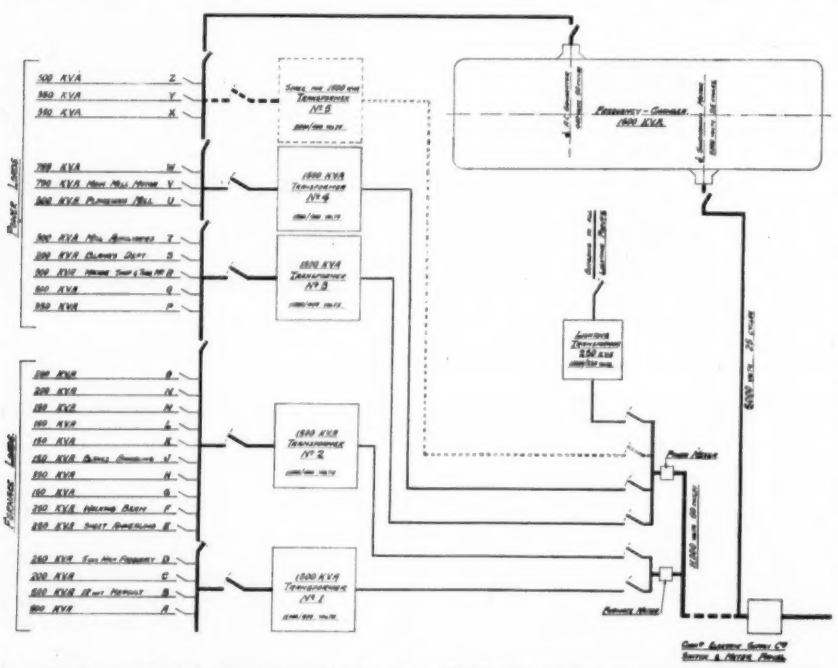


Diagram of sub-stations, &c., showing how distribution requirements were arrived at

Two 1,500-kVA transformers will be provided for the furnace load, and two similar transformers will serve for the power. The load and diversity factors of the furnaces are higher than those of the power demand.

The order for the l.p. board had to include bus bars and chambers to meet the final demands in current and number of circuits; all bus couplers; all chambers to accommodate feeder switches—but not the switches; special end chamber for the frequency-changer cables, and, based on the sequence in which sections of the extension scheme were planned to develop, circuit breakers, B, etc.

A crane serving the sub-station is sufficiently high to permit withdrawal of the transformer cores.

All outgoing glands are suitable for paper insulated, lead-covered, single armoured cables and all cables are run overhead. Some of these overhead runs are awkward, but the advantage of floor and road areas unencumbered by cable trenches outweighs the disadvantages.

When considering sub distribution boards in the works attention was given to the service required by groups and individual consuming units. Where quick resumption of the supply is necessary the unit type switchboard with circuit breakers has been provided, the supply to the bus bars being controlled from one of the circuit breakers in the sub-station. Ironclad, four- and six-way, fuse boards serve the circuits to apparatus, the operation of which is not seriously affected by the delay in replacing a blown fuse.

Power Factor and Symmetrical Components

Elucidating an obscure quantity in three-phase circuits

IF both the currents and voltages of a three-phase circuit are balanced, a clear conception can be obtained of the circuit power factor in terms of the phase difference of each line current with its associated phase to neutral voltage. If the circuit is unbalanced, a clear mental picture of the power factor is not so easy to obtain, since the phase relations of current and voltage are different in each line. The method presented below is designed to overcome this difficulty.

The power factor of a three-phase circuit is defined as the ratio of the total active watts to the total equivalent volt-amperes. As the latter quantity is equal to the square root of the sum of the squares of the active watts and the reactive volt-amperes, we can consider the three-phase power factor as the cosine of the angle whose tangent is the ratio of reactive volt-amperes to active watts, but this angle cannot be identified with the phase difference of either of the line currents with its associated voltage.

If the voltages of a three-phase circuit are approximately balanced, then a very clear conception of the nature of the circuit power factor can be obtained by means of the theory of symmetrical components. Assuming the voltages are exactly balanced, then there is no negative-sequence component in the voltage system. It is clear that, with this condition, the negative-sequence component of the current system can carry no power, since there is no voltage system of like phase sequence with which it can combine.

The active power in the circuit is thus due entirely to the positive-sequence component of the current. Now the reactive volt-amperes are measured in exactly the same way as the active watts, except that an artificial phase shift of 90 degrees is given to the meter voltages. If, therefore, the negative-sequence currents can produce no average torque in a watt-hour meter, it is clear that they cannot contribute to the value of the reactive volt-amperes as measured by the watt-meter method. Both the active watts and the reactive volt-amperes in a three-phase circuit with balanced voltages are thus due only to the positive-sequence currents flowing in that circuit.

This system of currents, being by definition symmetrical, it follows that the circuit power factor, as officially defined, is equal to the power factor of the positive-sequence currents or to the cosine of the angle of phase difference between these currents and the associated voltages. It will also be clear that the total equivalent volt-amperes is the same as the positive-sequence volt-amperes.

The co-existence of an unbalanced current system with an exactly balanced voltage system is, of course, theoretically impossible, but the voltage unbalance with unsymmetrical industrial three-phase loads is relatively small, and the conception developed above assists in the elucidation of a somewhat obscure quantity.

In a three-phase circuit with balanced voltages, the negative-sequence currents are literally wattless, in that they carry no power. It is interesting to note that the sum of the squares of the positive and negative components of an unbalanced system of three-phase currents is equal to the sum of the squares of the actual line currents. There is thus a mathematical analogy between negative-sequence currents and the reactive component of the current in a single-phase circuit.

G. W. STUBBINGS, B.Sc., A.M.I.E.E.

Radio Measuring Instruments. By E. H. W. Banner

Types and applications

FOR general testing purposes and experimental work with radio-telephone receivers, measuring instruments may be either permanently wired in circuit or of the portable plug and jack pattern.

A milliammeter is by far the most useful instrument for permanent inclusion in a set. If inserted periodically in each anode circuit and readings logged, it will show when a valve is losing its emission and a new valve desirable, apart from the other advantages of continuous indication of overloading, &c.

When testing a valve, it must not be oscillating, as the anode current may be very different under these conditions from the steady current due to the applied d.c. voltage. On the other hand, when testing a set for tuning adjustments the change of current, if any, is itself the information required.

[Elliott and Fry.

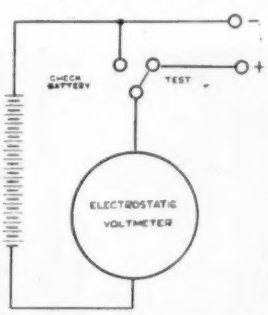
Mr. E. H. W. Banner, M.Sc., A.M.I.E.E., F.Inst.P., a member of Ferranti's staff, is an authority on measuring instruments

For testing h.f. valves the milliammeter may be connected to read either anode current alone or together with screen current; if the latter, it can be seen on disconnecting one circuit what is the current through the other. Once the screen voltage is fixed correctly, the current should remain constant. The normal anode current should be quite steady and an increased reading will generally mean excessive reaction or other cause of overloading.

Anode Bend Detection

From 1.5 or 2 mA is usual with anode bend detection, and the potentiometer should be adjusted to obtain 0.1-0.2 milliampere, the set being detuned or the aerial disconnected whilst the adjustment is made. On tuning a station the reading will increase to 1.2-1.5 mA for mains valves, or 0.7 mA for battery valves. If in excess of this, it should be reduced by some pre-h.f. volume control (such as an aerial series condenser), and, if less, reaction should be brought in. If the reading is still not more than about 0.5-0.75 mA for mains valves, or 0.3-0.5 for battery valves, the performance will be unsatisfactory and grid detection should be used instead. This will be the case in general with distant stations received very weakly. Excessive reaction will cause the reading to be high.

The greater the milliamperage of the rectified signal the better, provided that this is not accompanied by any movement of the pointer. A rough rule is to bring up the signal until the pointer does not remain steady and then reduce it to an amount which ensures steadiness. Movement of the pointer in the detector circuit can be caused by rectification and overloading occurring in the preceding h.f. stages when these are used. The pointer will go off the scale due either to a very big signal, which is quite desirable within the above limits, or due to the use of excessive reaction; the instrument can be used as a rough indicator of the amount of reaction applied.



With grid detection, as reaction is increased the anode current will decrease progressively until the set commences to oscillate with a "plop," when a further and sudden fall in current will be noted. The use of an anode milliammeter in this position is increasing in popularity. Adjustment should be made until a steady reading is obtained.

Adjustment of the Signal

Modern multi-stage sets usually require about 150-200 volts on the anodes with a consumption of 8-14 mA. The application of the signal to the valve, or increase of reactance, will generally cause the current to decrease and the amount of the decrease should preferably not be more than 20 per cent. of the reading with no signal. In any case the signal should be adjusted so that the pointer is steady.

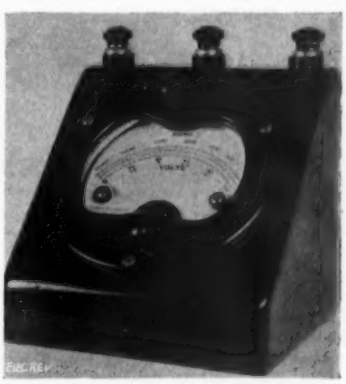
Whilst a milliammeter in the anode circuit of an intermediate low-frequency amplifier is of use, it is in general of less importance than in that of the power valve. It is important to maintain a steady reading, as any variation is passed to the power valve for further amplification. An old valve with reduced emission that is overloaded to obtain sufficient volume will therefore show a change of current when receiving a signal that a new valve will not, pointing to the need for a new valve.

Assuming the valve to be a good one, a slight fluctuation of anode current on particularly loud signals is quite in order, but a continual state of instability means definite overloading. On increasing the reaction steadily until the set oscillates with a "plop," there will usually be a transient increase of current, immediately recovering to normal unless the set is in violent oscillation, when the final reading, which may be steady or fluctuating, will be less than normal.

Causes of Overloading

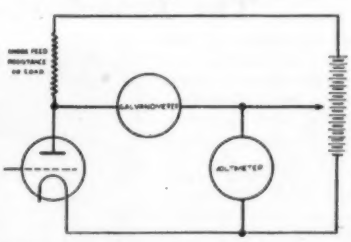
If when overloading occurs the pointer of the instrument kicks in an upward direction it will generally mean that the impedance in the output circuit is too low, and an output transformer of higher ratio should be used. If the pointer kicks downwards, it indicates that the ratio of the output transformer is too high. If, however, the pointer kicks up and down indiscriminately, ordinary overloading is occurring, which can be reduced only by reducing the signal or by inserting a larger power valve.

Assuming that the speaker impedance in the anode of the output valve is correct, as well as the output transformer ratio, and it is found that the pointer kicks upwards, it indicates that too much grid bias is being used. If it kicks downwards the grid bias should be increased. A rather higher output transformer ratio than normal can be corrected by increasing the grid bias without any material loss in quality. Any movement of the pointer in the output stage, particularly of a violent type, resulting from alteration of the tuning indicates that high-frequency current is being fed right through the receiver.



Resistance tester and voltmeter

A rhythmical up-and-down movement accompanied by a popping noise in the speaker, or sometimes even without this, indicates that serious back-coupling and "motor-boating" is taking place, more especially in the case of mains-operated apparatus. This can be cured only by proper decoupling by the incorporation of the "anode feed" system.



Left: Low d.c. readings with an electrostatic voltmeter. Above: Measuring anode voltage with battery

While it is unusual to mount a voltmeter to read exclusively either anode or filament voltage, it is often worth while mounting an instrument that will read both in addition to anode current. Such three-range instruments are listed by Ferranti, Ltd., and are made in a variety of ranges: alternatively, the valve tester or d.c. multi-range test set of the same firm may be used for occasional tests.

A moving-coil instrument should always be used for measuring anode voltage, and its resistance should be so high that the current taken by it is much less than the normal load.

When a.c. filaments are used a moving-iron or rectifier voltmeter is necessary. An error of, say, 5 per cent., renders it useless; a toy instrument may consume more than the filament and so cause an error due to the excessive load added by the voltmeter while it is connected.

Rectifier voltmeters are more expensive and, as a small transformer is usual for supplying the low voltage, there is a possible source of error due to bad wave form. The only

advantage of a rectifier voltmeter for such a purpose is in its lower consumption, 1 mA, or 1,000 ohms per volt, being now commonly obtainable.

Checking low-range a.c. voltmeters is not easy by direct comparison, but a simple way (if a good ammeter is available), is to obtain a fixed resistance of such value that it will drop a voltage equal to the range of the voltmeter when carrying the current determined by the ammeter range. For d.c. filaments the consumption of the moving-coil instrument is immaterial, but the accuracy must be first grade.

Valve and Battery Testing

There are several types of valve testers on the market. Perhaps the most generally useful is that which can be connected to any valve circuit and read the voltages, &c., actually applied in practice. Such testers have a plug which fits in the valve socket with another socket to receive the valve. These are excellent instruments for trouble-hunting and periodical checking.

A.c. voltmeter (0-10-100-250 V)

A battery cell-testing voltmeter and a hydrometer are invaluable, using both in conjunction with the battery maker's instructions. As cells should be charged immediately their voltage falls to about 1.85 volt on load, some accuracy is necessary, as a discharge to 1.80 volt may ruin the cell if it is not immediately recharged. The determining factor is the voltage on normal load.

Resistance Measuring

While a Wheatstone bridge is the standard method of measuring resistance, measurements can be made of sufficient accuracy for many purposes with the aid of a voltmeter and a source of supply. With full-scale deflection the current flowing is given by the voltage indicated divided by the resistance of the instrument in ohms.

Such instruments are marketed complete with a small battery and calibrated scale, so that the user merely has to connect his resistance to be measured to the terminals and read the scale, making a small adjustment from time to time to allow for battery voltage falling during life by means of a rheostat or, sometimes, a magnetic shunt to the movement. (The tester illustrated has a range of 50,000 ohms for resistances, and as a voltmeter the two ranges of 7.5 and 150 volts.)

An electrostatic voltmeter is invaluable for certain tests. With a.c. a small charging current flows, which (at supply frequencies) is entirely negligible, but at high radio frequencies it may approach microamperes; it is, in fact, directly proportional to the frequency. This small current flow is 90° ahead of the applied voltage, so that no consumption of power results. Another valuable feature is that it reads true r.m.s. values on a.c., independently of the wave-form of the supply, and also reads d.c. accurately. It may, therefore, be used as a transfer instrument from d.c. to a.c., so that one instrument can be made to serve both purposes—reading mains and anode voltages on a.c. and d.c., as well as being available for special tests as described below. A useful range is from 100 to 450 volts. It can be made to read low d.c. voltages and will then read anode, screen, and mains voltage (a.c. and d.c.) and the true voltage at transformer tappings, as well as peak voltages on a.c. with the aid of a rectifier valve.

There is no difficulty in measuring the voltages of either anode or screen when they are connected directly to a battery or eliminator and a suitable voltmeter can be used.

When a resistance or other load, such as transformer windings, loud speaker, etc., is between the anode or screen and the positive supply terminal it is obviously incorrect to apply a voltmeter to the supply and call its reading the anode (or screen) voltage. It is equally incorrect to connect the voltmeter directly to the anode or screen unless it is an electrostatic meter. When a pure resistance is in series with the anode its value can be measured; by measuring the current passing the drop across it can be found, and by subtracting this from the supply voltage the anode or screen voltage is obtained.

Direct Voltage Measurement

It is possible to measure the voltage directly, however, by means of an artifice, using a voltmeter of suitable range and a microammeter or low-reading milliammeter. A diagram of connections is shown above. The tapping on the battery is varied until the microammeter or milliammeter shows no deflection. The voltmeter reading is then equal to the anode or screen voltage. The voltmeter must be of high resistance.

A simpler modification of less sensitivity is to use the voltmeter itself in place of the galvanometer shown, adjusting the tapping to zero reading, and then connecting the voltmeter across the part of battery in use. The sensitivity increases as the range decreases, so that the galvanometer or milliammeter is preferable if available.

An alternative method is the use of an electrostatic voltmeter reading from 100-450 volts; if the measurement to be made is over 100 volts the instrument may be used directly, but if lower the instrument may still be used if it is suitably biased by a dry battery or accumulator. The circuit shown in the left-hand diagram, p. 769, enables the battery itself to be checked at the same time, without assuming its voltage to be the nominal for the number of cells or introducing errors due to fall of terminal voltage whilst being measured by any other type of voltmeter.

For general testing a multi-range instrument is almost always preferable to a single-range one, and the d.c. moving-coil movement is particularly well adapted to numerous ranges by means of series resistances for voltmeter and shunts for ammeters.

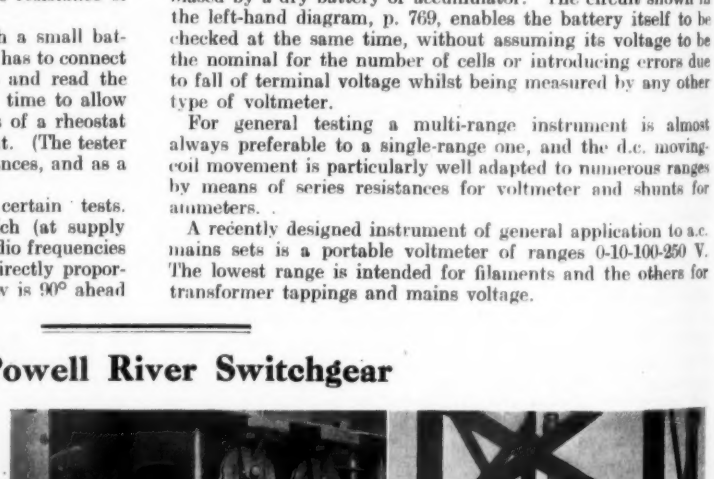
A recently designed instrument of general application to a.c. mains sets is a portable voltmeter of ranges 0-10-100-250 V. The lowest range is intended for filaments and the others for transformer tappings and mains voltage.

The Powell River Switchgear

IN Mr. F. H. Fullerton's account in our May 6th issue of hydro-electric power production on the Powell River, British Columbia, for a pulp and paper plant, it was stated that all the switchgear was supplied by a Canadian firm. We are informed by Messrs. Ferguson Pailin, Ltd., that they supplied a 12-panel draw-out truck cubicle switchboard, each cubicle being fitted with a 1,200-A three-phase type PA electrically operated oil circuit breaker. The system voltage is 2,300 V.

The fixed portion of the switchboard was built up on site, the framework being of sturdy construction to withstand the short-circuit kVA that might have to be dealt with. Racking mechanism is provided for the truck portion with self-aligning pressure contacts between the fixed and moving sections.

In addition, Messrs. Ferguson Pailin supplied a 4,000-A triple-pole circuit breaker, consisting of three single-phase breakers coupled mechanically to a motor-operated free-handle mechanism, for 6,600-V service. It is used to control the alternator output, and was one of the largest of its kind in the world at the time of installation. A five-year guarantee with bond was given against failure of the oil circuit breaker when clearing short circuits.



One phase of the F.P. alternator output switch and its motor-operating gear

An Unsheltered Profession. By Rear Rank

What is a consulting engineer ?

THE term "consulting engineer" in its best significance is defined in the rules of the Association of Consulting Engineers as "a person possessing the necessary qualifications to practise in one or more of the various branches of engineering who devotes himself to advising the public on engineering matters or to the designing and supervising of the construction of engineering works and for such purposes provides his own office and staff and is not directly or indirectly concerned or interested in commercial or manufacturing interests such as would tend to influence his exercise of independent professional judgment in the matters upon which he advises."

Such a definition excludes, not on any ground of lack of knowledge, those engineers among the corporate members of the Institutions of Civil, Electrical, and Mechanical Engineers who are in the service of manufacturing and/or contracting firms from whom their clients may be making purchases, as well as, with less reason, the engineers in charge of the roads, drainage, water, electricity, or traction undertakings of large cities, and the heads of State engineering departments.

The Expert Witness

In disputes as to patent validity, nuisance, breaches of certain covenants, or failure of structures, the evidence of the engineer is as essential to present a case to His Majesty's judges as is the evidence of the analyst or pathologist in criminal cases. That is to say, the profession of a reputable consulting engineer is tacitly recognised in the Courts and in the Committee Rooms of the Legislature, and affords a hall mark of status in work for other clients. That work for other clients may touch the industrial and financial fields.

The general public looks in prospectuses of a certain class for extracts from reports of consulting engineers. Very grave responsibility may rest on such reports; for favourable reports are only quoted in order to induce investors to take up shares. Then, again, when loans are sought, or money has to be raised against debentures or a further issue of shares, a consulting engineer's certificate that the works, plant and machinery are well maintained and that the processes are efficient and up to date should be the logical corollary to an examination of the books by a chartered accountant. Other countries come to London for the capital needed for their development.

Independent and absolutely unbiased investigations are needed and estimates of expenditure need scrutiny; it is well to be satisfied that contingency margins have been provided. There are not many Admirable Crichtons among consulting engineers; they are rather specialists in a few related sections of their work. Beyond these sections they do not care to go, and, therefore, either the financial interests engage the necessary specialists or run the risk of having the field inefficiently covered.

Members of a Caste

The caste of the consulting engineer is partly hereditary, and in the room in Great George St. two past presidents look down upon the bearer of their name of the fourth generation who is practising as a consultant in the field in which they made their reputation.

The major part of the recruitment is, however, from the rank and file. Some leave the professorial chair of the university for consulting work; others with special experience on construction work join established firms of consulting engineers; and still others, probably the majority, having worked as resident engineers in large schemes, have risen to the chief positions, and some *magnum opus*, say a dock, bridge, or dam of their design, has been completed under their supervision.

If the last retain their posts, they can only look forward to years of relative stagnation. What more natural than their resignation and migration to Westminster, assured that they will probably be retained in an advisory capacity by those they lately served, and certain that as free lances there will be full play for their talents?

To a lesser extent the specialist designers of manufacturing and contracting firms join the profession, sometimes to be consulted by their old employer on questions of design, but looking mainly to obtaining advisory work from commercial undertakings of all types.

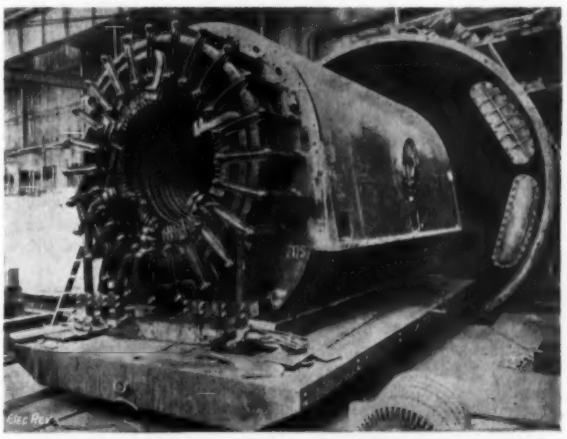
Recruitment is easy because of the large number of fully qualified engineers in public and private employ capable of filling any vacancy. As in commerce, there is most room at the top of the tree; such overcrowding as exists is among the lesser men, specialists in small and restricted fields, or men whose previous experience in wider fields has been with small efficient achievements rather than with the spectacular.

The profession of consulting engineer is anything but sheltered in the sense that the legal, medical and dental professions are sheltered. Membership of the Association of Consulting Engineers implies acceptance of all the restrictions relating to professional etiquette as are enforced in medicine or in the law. As in medicine, the only legitimate publicity is that of a brass plate, and papers read before scientific institutions. But some purists desire to omit the brass plate, and others profess a pride that not once in the two or three decades of their practice have they descended to such a pavement publicity action as writing papers. This may be all very well for the eminent, whose names are of world-wide repute, but what of the others? How many people know that there are consulting engineers adhering to a code? And how are those who do know that the caste exists to discover which members specialise in certain subjects?

Yet with these voluntarily accepted restrictions, the consulting engineer knows that the shelter given by the law to the registered medical practitioner is not for him. He knows that any man parading himself as a consultant may give evidence or sign a report for the prospectus of a public company, while no one who has not passed certain examinations may practise as a solicitor.

Unhealthy Competition

What of the rivals of those who have formally accepted the code? They include many who would be found to be as



Stator of the 30,000-kW Hackney alternator entering drying chamber **(see p. 764)**

thorough in their observation of that code as those whose assent is specifically proclaimed. They also include those who style themselves consulting engineers while engaged in selling the machinery or products of certain firms.

Perhaps more serious to some sections is the competition of certain insurance companies who advertise in the popular Press their ability and willingness to advise factory owners upon such subjects as extensions or conversions of their works.

Then again, large manufacturing concerns have on their staffs specialists of great skill, and it is by no means beyond their ability to put forward to a mining company a tender for an electric power house complete in all respects with its distribution systems and utilisation of the energy in connection with mills, furnaces, haulage, pumping, and so forth. Even the large manufacturing concern does not make everything—but that does not prevent it from putting in a comprehensive tender embracing every item.

The purchaser who imagines that he saves a consultant's fees is only preferring heavy indirect taxation whose incidence is disguised to an undisguised lighter direct taxation.

The professional cards of consulting engineers are to be found in the announcement pages of Scandinavian and of North American technical journals. Even the names of British consulting civil engineering firms have so appeared in the latter, and the names of highly reputable British consulting mining engineering firms continue to do so. Is any one any the worse morally? The purist will say "Look at the loss of prestige!" But the prestige of a sheltered profession is one thing, and that of an unsheltered profession another.

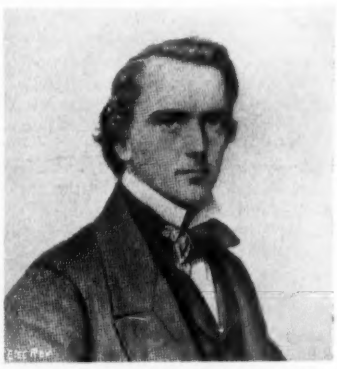
All that can be urged against a strictly regulated and standardised form of individual advertising is that our national proclivity for compromise is perhaps more likely to result in a collective advertising undertaken by the Association on behalf of its members. Half rations are preferable to none.

Centenary of Sir Charles Tilston Bright

The engineer who laid the first Atlantic cable

IN the ever memorable feat of uniting the old and new worlds by a submarine cable—the boldest electrical project known up to the middle of last century—Sir Charles Tilston Bright, the centenary of whose birth occurs on June 8th, established his own title to enduring fame.

Bright was a lineal descendant of two old Yorkshire families. On the side of his father, Brailsford Bright, he belonged to the Hallamshire Brights, a name widely known in the Hundred of Hallamshire, comprising Sheffield and a considerable adjacent area, whilst his mother was a Tilston, also a familiar name in the annals of the county.



Sir Charles Tilston Bright at the age of twenty-six, when he received his knighthood

Born at Wanstead on June 8th, 1832, Bright was educated at the Merchant Taylors' School, and was intended for an Oxford career, but pecuniary losses by his father entailed a change of plans, and at fifteen, together with his brother, he entered the employ of the Electric Telegraph Company, established to work the patents of Wheatstone and Cooke.

The two lads were both keenly interested in chemistry, and it was not long before they began to exhibit unusual inventive faculties. They could not afford the heavy patent fees then demanded, so for the time contented themselves with entering their ideas in a joint invention book, kept under lock and key. One of the entries in this volume embodied the first outlines of Bright's celebrated and often-quoted patent of October 21st, 1852, "for improvements in making telegraphic communication, and in instruments and apparatus employed therein, and connected therewith."

Early Experiments

In this matter, as in other novel applications of electricity, which subsequently came into common use, Bright showed himself a worthy compeer of Siemens, Latimer Clark and Faraday, who had each in turn investigated the problem of the transmission of signals from long distances.

Bright presently joined the British Telegraph Co. as assistant engineer. His brother Edward had meanwhile entered the service of the rival concern, the Magnetic Company, which had secured an Act for the exclusive right to lay overhead telegraph lines along public highways.

In 1852, however, Charles accepted the appointment of engineer-in-chief to the Magnetic Company, and in this capacity was responsible for the laying of underground cables between London, Manchester, Liverpool, and other centres in this country. He also laid the first cable in comparatively deep water, that connecting Port Patrick and Donaghadee, in Ireland.

While engaged with the Magnetic Company he was continually experimenting in long-distance electric telegraphy. He was joined in his researches by E. O. Whitehouse, and when, in 1856, at the age of 24, he was appointed chief engineer to the newly formed Atlantic Cable Company, Whitehouse was associated with him as electrician. The directors of the concern, it may be mentioned, included Professor W. Thomson, afterwards Lord Kelvin.

Cable Fractures

The idea of an Atlantic cable had originally been mentioned by Professor Morse in 1843, but the unknown depth and supposed rocky nature of the bottom of the ocean had checked enterprise, and it was not until the discovery by Lieutenant Maury, of the United States Navy, that the sea-bed between Ireland and Newfoundland was virtually level and covered with soft ooze that interest was reawakened. Bright, with Cyrus Field and Brett, had thoroughly discussed the practical methods to be adopted, and the co-operation of the governments of Great Britain and the United States was secured, the former placing at the disposal of the company for cable laying the battleship *Agamemnon*, and the latter the frigate *Niagara*.

Unfortunately, the gauge of the conductor had been determined before Bright's appointment, and when operations commenced he was overruled in regard to the choice of starting point. It was his view that the work should begin in the middle of the Atlantic, but it was actually decided to commence from the Irish coast. A start was made on August 4th, 1857, and only five miles of cable had been paid out when a breakage occurred. No time was lost in commencing again and this time the cable was carried 380 miles before a second fracture took place in 2,000 fathoms of water.

It was found impossible to pick up the broken end, and so the work was abandoned, and the ships returned to Plymouth. The winter was occupied in duplicating lengths of cable, and in improving the paying-out machinery.

Difficulties Overcome

When the undertaking was resumed on June 10th, 1858, Bright's plan of operating from mid-Atlantic was adopted. The initial step proved a failure, and differences of opinion respecting the expediency of proceeding with the scheme manifested themselves among the directors. It was, however, finally decided to make a further attempt, and the paying out of the cable from mid-Atlantic was commenced on July 29th. Many difficulties were encountered. The cable ships were buffeted by severe storms, and at one time it was feared that the *Agamemnon*, overweighted by the dead load of the cable, would founder; but courage and tenacity triumphed, and on August 5th the two ships safely reached their respective destinations.

The great task of uniting Europe with America had been successfully accomplished. Altogether 2,050 miles of cable weighing one ton per mile were laid, the *Niagara* paying out 1,030 and the *Agamemnon* 1,020 miles.

The first clear message was transmitted on August 13th, 1858. The result left much to be desired. So feeble was the current that it took 67 minutes to cable a 90-word congratulatory telegram from Queen Victoria, and after a few more messages the line became entirely dead.

Nevertheless, the feasibility of laying an electric wire across the Atlantic had been conclusively established and, in recognition of his distinguished services to applied science, and to his country, "as the engineer responsible for securing the first established telegraphic communication between the two worlds," Bright, then only 26, received the honour of knighthood. Between 1861 and 1873 he was mainly employed in cable laying in the Mediterranean, the Persian Gulf, India, and the West Indies.

In the later years of his life he collaborated with Latimer Clark in many experiments of the utmost value alike to the electrical industries and to telegraphy. Among other things they discovered new methods of insulating gutta percha covered wires. A joint paper read before the British Association at Manchester in 1861 led to the setting up of the Committee on Electrical Standards. They rounded off their labours by patenting an improved method of applying asphalte composition as a covering for submarine cables. He had many other interests besides submarine telegraphy. For example, early in 1888 he undertook to act as engineer to the St. James' and Pall Mall Electric Light Co.—a report to the board had been drafted just before his death in May of that year, but it remained unsigned.

Lord Kelvin's Tribute

Bright represented Greenwich in Parliament from 1865 to 1868, and was one of the British delegates to the Paris Exhibition in 1881. The French Government awarded him the Legion of Honour.

He was a member of the Institution of Civil Engineers and the Institution of Electrical Engineers. He read a paper before the Institution of Civil Engineers on "The Telegraph to India and its extension to Australasia and China" in 1868, and four evenings were devoted to its discussion. For this paper he was awarded the Telford Medal. This, it will be noted, was some years before the Institution of Electrical Engineers was established (as the Society of Telegraph Engineers).

In 1889 Lord Kelvin, in the course of his presidential address to the I.E.E., said:—"To Sir Charles Bright's vigour, earnestness and enthusiasm was due the successful laying of the first Atlantic cable. We must always feel deeply indebted to our late colleague as the pioneer of that great work when other engineers would not look at it and thought it absolutely impracticable." On another occasion Lord Kelvin said that Sir Charles was the first successfully to lay a cable in "really deep water."

His son, Sir Charles Bright, F.R.S.E., has been well known in the submarine cable world for very many years; reference is made to his work and career in our "Personal" page to-day.

Motor-operated Bulkhead Doors. By C. H. S. Tupholme

MOST electrical engineers are familiar with the principles of motor-driven valves, the controls for all valves being situated, if convenient, on a centralised switchboard. One of the latest applications of this system is to ships' watertight doors, each of which is under the control of an officer in the pilot house, who can, at the same time, see instantly the position of any door, whether open, moving, or shut.

A master switch is employed to close all doors, and one individual switch for each separate door starts any of the bulkhead doors to open or shut. One additional watertight switch with an operating lever on either side of the bulkhead itself permits independent operation of the door locally, but when the control switch in the pilot house is closed it takes precedence over the local switches. Thus a man trapped by a bulkhead door can release himself, but the door will automatically close again immediately in response to the position of the master control switch. Means for locking each local control station is provided, so that in any emergency the door can be prevented from being opened from the centralised control panel.

The door-operating unit employs a high starting torque motor, and when the switch is closed the motor comes up to full speed before unseating the door with a sharp impact. Manual operation of the door is not interfered with. All the equipment is, of course, waterproof.

The door-operating unit consists of a driving motor, reduction gears working in oil, limit switch mechanism, and a solenoid-operated pawl. The driving motor is totally enclosed and is steam and splash-proof, or waterproof, as required. The normal speed of the motor is 4,000 r.p.m., while that of the low-speed shaft of the reduction gear is 100 r.p.m.

The Clutch System

Referring to the illustration, the motor shaft is coupled to the worm shaft A by a two-jaw clutch, both motor and worm shafts running in ball bearings. The worm wheel B is keyed to a sleeve forming the sun pinion C of a planetary gear. The three planet pinions D revolve on large studs E, forced into a flange F, forming part of the low-speed driving shaft G. These planet pinions mesh with the internal gear H, which is the outer member of the planetary gear system. The internal gear H fits into a machined recess in the casing, in which it revolves freely. The outer surface of the internal gear is provided with a peripheral channel containing two stops. A restraining pawl J is moved into the clutch position by the solenoid magnet K, which straightens the holding toggle L, holding the pawl rigidly in place.

When the motor is started the internal gear revolves without load until the stop is brought up against the pawl, suddenly arresting the movement of the internal gear and producing the unseating blow. With the internal gear stopped, the low-speed shaft continues to revolve to open or close the door until the limit of travel is reached.

When the door is firmly closed or fully opened, as the case may be, the proper limit switch opens the solenoid circuit, thereby permitting the restraining pawl to be quickly withdrawn by spring action. The low-speed shaft and door parts stop immediately without jamming, and the motor is at the same time disconnected from the circuit. On withdrawing the restraining pawl, the internal gear is free to revolve with the planetary gear system, thus absorbing the momentum of the motor and bringing it to rest. The shape of the restraining pawl is such that should the spring be broken or inoperative, the driving strain will force it out of engagement with the internal gear if the solenoid is de-energised.

Arrangement of Limit Switches

The limit switches are of the quick-break type with finger contacts. They are arranged to open the secondary circuit, carrying the maximum of 2 A. The main motor current is broken by magnetic relays. The limit switches are operated by means of a train of reduction gears driven by the low-speed shaft, the gears being contained in the casing and running in oil. Accurate limit adjustment is obtained by means of a micrometer screw.

These door-operating units do not require declutching for working by hand, the hand gear being such that the electric drive and control are at no time disturbed. The limit switches, being operated by the low-speed shaft, are always directly connected to the moving parts of the door. Any hand operation results in the limit switches automatically assuming positions corresponding to that of the door, thus permitting power operation to be taken up again at any time without adjustment of the apparatus.

The reversing relay panel, one for each door, carries two main double-break motor contactors with mechanical and electrical interlocks. The jam relay, a double pole, fused main line switch, and suitable terminals are also carried.

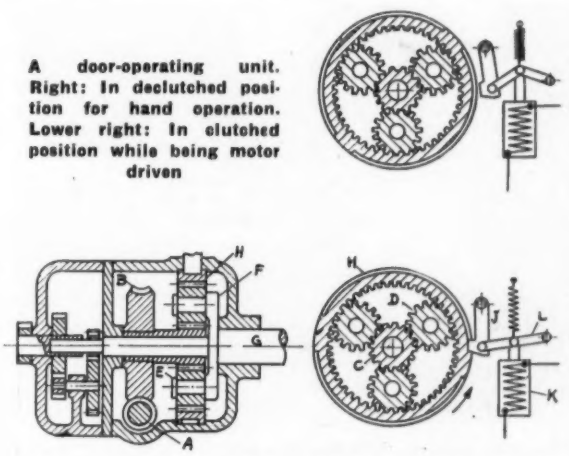
To prevent overloading the ship's electrical system when the master switch on the centralised control panel is operated, an automatic timing relay panel is fitted. This panel functions when the master switch is thrown to close all doors simultaneously. The fingers on the relays are staggered and make contact one at a time as the relay closes slowly against the action of the dashpot. The closing speed of the relays is adjustable.

Method of Control

The control system consists of the apparatus described and a monel metal plate etched to show the outline of the decks of the ship and the bulkheads. A tumbler switch and one red and one green lamp are inserted in the plate at the corresponding position of each watertight door. The number of each door is also etched on the plate. There is one switch for each door, and also, as already mentioned, a master switch for controlling all doors.

The indicating lamps operate as follows: when the door is open, with all controls in the off positions, no lights indicate. When the door is closing the green light is on as the control station makes contact, and the red light shows when the door starts to close. During the travel of the door both the red and green lights are on. When the door is closed the red light remains on and the green light off. When the door is opening, the red light is on and the green light shows as the door starts to open. When the door is fully open, the red light goes out and the green light is on until the station is thrown to the off position.

The local control switch is waterproof and is flanged to permit mounting in a hole cut in the bulkhead, so that half of the switch extends through both sides of the bulkhead. Two operating levers, one on each side of the bulkhead, are installed. An audible signal is installed for each door.



A door-operating unit. Right: In declutched position for hand operation. Lower right: In clutched position while being motor driven

A Domestic Consumer's Criticism

AN electrical man who, as the expression goes, "takes his own medicine," and uses electricity for domestic purposes, has certain criticisms to offer.

He recalls the articles and letters that have appeared in this journal on the importance of giving good service as a means of spreading domestic electrical development more rapidly and asks whether experiences through which he has recently passed are exceptional to himself. He cites the case of a boiling ring which was sent through a factor to the makers' works for a new element to be fitted, and continues:—

Directly it was put into use it was found to have been incorrectly connected to the three-heat switch, making it quite useless. It was moreover leaking to the frame. It was returned to the makers—very well-known people—who took their time about sending it back. On this occasion it was impossible to put the ring into service because the contact pins had been rearranged so that the socket attachment, sold as an integral part of the apparatus, could not be plugged on to the pins.

For the third time it came back to me. For a short time all went well and then half the spirals refused to glow and shocks were reported. The factor discovered before he sent it back to the works that a certain screw was about twice as long as it should have been, clearance between live parts and frame when cold being so small that good contact was established when the ring was heated. It was given a fourth trial, and was discarded altogether when it gave unpleasant evidence that the makers were incapable of insulating the spirals from the frame. Need I say that there was no provision for earthing the apparatus?

My second experience was with an electric kettle. After being in use for about a year a tiny leak developed where the contact pins were attached to the kettle. The repair (including postage) cost 5s., and for forty-seven days I had to be at the loss of the difference in energy consumption between boiling water in an electric kettle and in an ordinary kettle on a hot plate. During that period I called three times on the local manager but could get no tidings whatever.

Needless to say, this is distinctly annoying and seems to be far enough away from all the big sales talk (or is it cant?) that we have been listening to lately.

Welded Steel Structures

Important developments reported at an international conference

AT the invitation of the British Advisory Committee of the International Association for Bridge and Structural Engineering, Major James Caldwell has prepared a report on "British Practice in the Welding of Structural Steel Work" for consideration at the Congress of the Association, which is being held in Paris this week.

The report explains that welding by means of the oxy-acetylene blowpipe has not met with much support in Great Britain for the assembly and reinforcement of steel bridges, but it has been used extensively for cutting shapes in new work and the removal of defective steel members. Electrically welded construction has, however, developed into general practice.

The British welding engineer, in pinning his faith to the heavy-coated electrode, maintains that the production of a metallurgically sound weld under practical conditions should not depend entirely on the skill of the operator, but, so far as is possible, on the natural function of the electrode during fusion. Therefore, a suitable covering should be provided on the electrode to form an active slag that will (i) clean the surface of the parent plates from oxide during welding; (ii) protect the weld metal whilst molten from atmospheric gases, and therefore prevent oxide and nitride defects from forming in the metal; and (iii) melt at a low temperature and thereby not be trapped in the weld metal as slag inclusions.

Types of Joint

Bare wire welded structures of the open-truss type, with their general use of the simple lapped joint and rolled steel sections, do not appear to differ very largely in form from riveted structures. In Europe there is a more advanced tendency to design welded structures on a monolithic basis with a general use of butt-welded points, even in main members.

Transport Congress delegates at L.C.C. repair depot, Charlton

A further characteristic of considerable importance and individual to structures welded with heavy-coated electrodes, is the general application of light single run fillet welds. This practice, although of comparatively recent introduction, has been successfully developed to an advanced degree in Switzerland and Australia. The linear strength of a fillet weld is approximately proportional to the square root of the linear volume of weld metal deposited, so that the economic advantages of the light single run fillet weld are paramount. A further asset is that welding contractional stresses are reduced to the minimum, and, more important still, the soundness of a weld can be judged by expert visual inspection, provided that correctly constituted heavy-coated electrodes are applied.

Welding committees have been formed in many parts of the world, and their research engineers are submitting welded construction to exacting scrutiny. More is now known of the behaviour of welded joints than of the behaviour of riveted ones.

Most public bodies are inclined to err on the side of safety by specifying low allowable stresses, and this is likely to prohibit, or seriously limit, the welding of structural steelwork on economic grounds.

Factors of Safety

In Great Britain, for a 28/30 tons per sq. in. steel, the allowable working stress in tension is 8.0 tons per sq. in. (*i.e.*, a factor of 3.5). Owing to the unequal distribution of stress induced in tension members by riveted joints, the actual breaking strength is reduced by 20 per cent., so that the effective factor of safety is 2.8. In compression the allowable working stress is 6.5 tons per sq. in., which, when compared with the yield strength of the steel (18.0 tons per sq. in., the point of failure in compression), shows a factor of safety of 2.77, which is roughly the same as that for tension. A factor for welding equal to that for the steel, or at the most 4.0, would appear to be ample.

The static strengths of welded joints are of secondary importance, except for use in design. Factors that deserve more attention are the resistance of welded joints to dynamic stresses, corrosion, solidity and ductility in the weld metal, and, above all, consistency under practical conditions, *i.e.*, its reliability.

Over 100 bridges have been strengthened by welding on Australian railways, and a considerable amount of important work has been carried out in Great Britain. Similar operations are either in progress or contemplated in India, South Africa, and certain of the Crown Colonies.

In some cases the only alternative to strengthening by welding is complete renewal. The cost is invariably much less than when other methods of reinforcement are employed. Delays to traffic passing over the bridges are avoided or greatly reduced. In most cases underpinning or staging is unnecessary, and the existing structure is not weakened or disturbed.

The strength of a combined welded and riveted joint may be estimated as the ultimate strength of the welding plus the yield point strength of the riveting. In strengthening lattice girder joints it is necessary to ensure that the additional stresses carried by the welding are transmitted across the joint to the member on either side; that is to say, clear of the sections that are weakened by the existing rivet-holes, which may entail the use of extra gusset plates.

On behalf of their respective authors, Major Caldwell also submitted to the Congress several descriptive papers representative of welding practice overseas.

Work in Australia

Mr. H. E. Grove's paper explains how, during the past ten years, the Metropolitan Gas Co. of Melbourne has fabricated and erected over 15,000 tons of welded steelwork. The tonnage is not the most impressive feature, for the company is debarred from tendering for outside contracts, but the fact that each type of welded structure it attempted was the first of its kind. The company's considered opinion is that only the highest quality electrodes should be admitted into structural steelwork, and it employs only heavy-coated blue asbestos yarn wound electrodes of the "Uranium" variety. Its present tendency is towards the application of heavy gauge electrodes and larger currents than have been considered advisable hitherto.

Mr. W. D. Chapman describes the use of electric welding on 115 railway and twenty-one highway bridges; three railway and four highway bridges were wholly welded. Welding has only been introduced where it shows a definite saving in cost. Useful welded details, such as stiffeners on plate girders, are introduced freely on new riveted work. The early work was carried out with covered mild steel electrodes. Latterly alloy mild steel electrodes, carrying a percentage of manganese, or manganese and chromium, have been used with greater economy. It is claimed that the weld metal from these electrodes is less variable than rolled mild steel, and of the same order of quality.

Messrs. R. Worley and J. R. Baird describe the conception and construction of a large standpipe reservoir in Hamilton, of exceptional interest in that it forms a most important advance in the application of electric welding to the reinforcement joints in ferro-concrete construction. The reservoir has a capacity of 3,000,000 gallons, with a minimum diameter of 84 ft. and a minimum top-water level of 85 ft. above foundation level. The project did not appear to be economically feasible by any of the usual methods of reinforced-concrete construction, but by the liberal and unbiased application of arc welding the designers produced a structure revolutionary in design and at an erection cost per ton of the steel which was less than two-thirds the cost ruling locally for contracts employing other methods.

Apart from the greater stability attained, the cost of building a similar capacity standpipe by any other method would have been over £30,000, with grave doubts as to its success, against the actual recorded cost of £24,000, including research, with no fears as to its safety or watertightness.

A Factory in Canada

The Peterborough works, Toronto, of the Canadian General Electric Company is the first building in Canada of an appreciable size to be completely fabricated and erected by the electric arc welding method. It has a floor area of 72,000 sq. ft., and is 80 ft. wide, with columns spaced at 25 ft. centres. The structure contains 960 tons of steel, and provision has been made for one 25-ton and two 5-ton bridge cranes of 77 ft. span. Only three weeks were required from the erection of the first column till the completion of the work. No inspector was placed in the fabricating shops during the progress of the work, though all welds were inspected on the arrival of the steelwork at the site.

Some 360 tons of steel was shipped directly from the rolling mills to the site, delivered cut to proper lengths, and the necessary punching was done by the field forces before starting erection operations. Field forces were engaged about one month before starting erection; the shop fabrication occupied about six weeks. Each operator was required to weld test pieces before starting, and periodically whilst the work was in progress.

Road Transport Problems

Traffic experiences with modern tramcars and trolley-buses

LAST week we gave a report of the papers read at the congress of the Tramways, Light Railways and Transport Association. The annual general meeting was held on May 19th, and the chairman (Mr. E. H. Edwardes) was elected for a further period of one year, after the expiry of his three-years term of office, with a view to the completion of certain negotiations.

Mr. Edwardes mentioned that the temporary powers of increasing charges granted to some undertakings would probably be continued for another three years, due to representations made by the Association. A joint committee had been set up by the Post Office to investigate complaints of interference by trams and trolley-buses with broadcasting. Choke coils had been fitted to the trolley-buses of the L.U.T. Co. and satisfactory results had been obtained.

The following were elected to the Council: Messrs. P. J. Baker (general manager, Southampton), L. M. Myers (British Electrical Federation), A. R. Hoare (Stephen Sellon and Partners), J. M. Calder (general manager, Reading).

Mr. A. V. Mason (left), deputy general manager and engineer, Metropolitan Electric Tramways, Ltd., and Mr. T. E. Thomas, general manager of the L.C.C. Tramways, at the Charlton Central Repair Depôt

Where Tramcars are Preferred

In opening the discussion on the papers of Messrs. C. F. Sinclair (L.C.C.) and W. H. Shaw (M.E.T.), Mr. C. Hopkins said that the public in Sunderland definitely preferred the modern tram to the bus. The bow collector had been found a great advantage and roller bearings on the trucks had eliminated tail wagging and jazzing. Rubber tile flooring and ¾-in. rubber strip between the car body and the truck had greatly reduced noise. The axle disc brake fitted with Hoffman roller bearings had been most successful.

Mr. W. Vane Morland advocated making provision for a much larger number of standing passengers than was now allowed. He referred to a reversing device successfully used at Leeds for preventing de-wiring of the trolley. Mr. S. R. Geary (L.C.C.) urged the need for automatic change-over from trolley to conduit.

Mr. R. S. Pilcher favoured regenerative control of tramcars, which was used largely in Paris in spite of the use there of the conduit system. Disc brakes in Manchester became too noisy after a short time. The modern type of tramcar should have been introduced ten years ago; he feared that it was now too late.

Mr. F. A. Fitzpayne said that improvements in Edinburgh included the use of hollow axles and aluminium wherever possible. Mr. C. S. Spencer stated that in London the life of the rails was often only three years owing to the effects of magnetic brakes.

Mr. Sinclair in his reply expressed the view that it would not be possible to use the trolley wheel at 30 m.p.h. He was not impressed with regenerative braking and believed that magnetic brakes did all that was required, because braking depended on the static friction between the wheel and the rail.

Regenerative Control

The discussion on the paper by Mr. G. H. Fletcher (Met.-Vick.) was opened by Mr. Bacqueyrisse, general manager of the Paris Tramways, who spoke of his operating experiences, and referred appreciatively to the help he had received from Mr. A. L. C. Fell (L.C.C.) when the Paris system was being converted to electric traction.

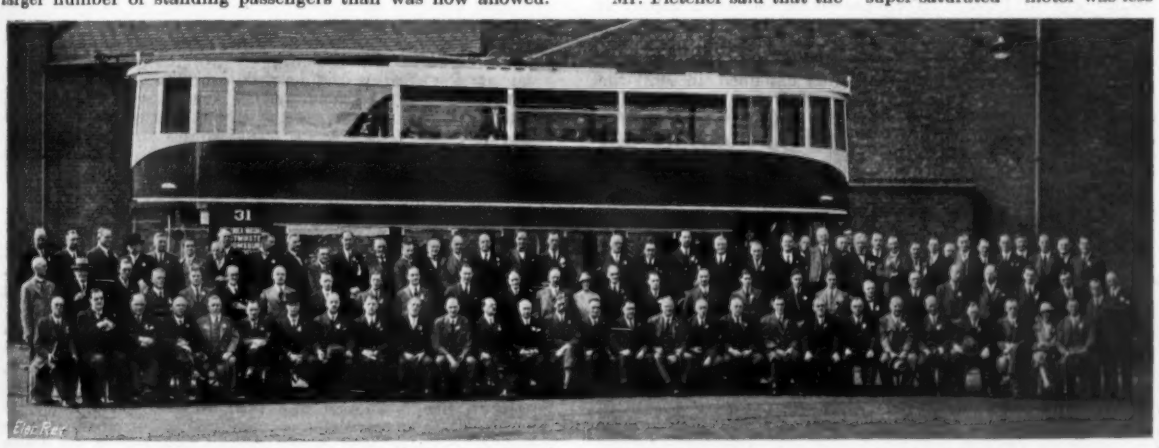
Mr. W. A. Stevens spoke of his regenerative system as applied to the earlier trolley-buses at Wolverhampton and Hastings. The regenerative current was limited to 60 A by the counter-compounding effect of the series winding, which was insufficient to control the vehicles on the steepest gradients. A development of the system in use on the S. Lancashire Transport Co.'s system (to which the chairman later referred appreciatively) provided for the short-circuiting of the compound winding as soon as regeneration took place and for its being open-circuited in the compounding direction with a low resistance shunt across the series winding. Easily controlled regeneration up to 250 A and rheostatic braking, effective with the trolley on or off the line, were obtained.

Field-regulated Motor

Mr. F. A. Fitzpayne said he intended to equip a section of the Edinburgh tramways for regenerative control with a view to speeding up the service without increase in energy consumption. Mr. G. F. Sinclair doubted the possibility under regeneration of securing equal division of the load between the motors under certain conditions which may obtain.

On May 20th the paper by Mr. C. J. Spencer on "Tramcars and Trolley-buses" was discussed. The author stated that the new 12-ton trolley-buses of his company used considerably more energy than 20-ton (including load) tramcars, probably due to the tractive effort of the rubber tyres on the road. Two vehicles were equipped with B.T.-H. and E.E. super-saturated motors, and the starting current was reduced by 30 per cent. and the energy per car mile by 15 per cent.

Mr. Fletcher said that the "super-saturated" motor was less saturated than the ordinary type; the proper term was the "field-regulated motor."



Delegates to the Tramways & Light Railways Congress at the L.C.C.'s tramway depôt at Charlton

The Burdens on the Tramways

The annual dinner was held at the Hotel Victoria, W.C., on May 19th, with the president of the Association, the Rt. Hon. Sir Arthur Stanley, in the chair. Mr. W. Chamberlain (chairman, Traffic Commissioners, N.W. area), speaking in place of Mr. P. J. Pybus (Minister of Transport), who was prevented at the last moment from attending the function, said that during the past two years there had been the closest co-operation between municipal, company, and private transport.

Mr. E. H. Edwardes (chairman of the Association) suggested that when loans were granted to municipalities for purchasing buses, cognisance should be taken not only of the overhead lines and equipment abandoned, but also of the loss of load to the grid. He believed that the Road Traffic Act would be of considerable benefit to passenger transport.

The Rt. Hon. Herbert Morrison referred to the unjust burdens imposed on the tramways in the laying and maintenance of tracks used by other vehicles and in the paying of rates on them. He regretted a tendency in the House of Commons to harass the Traffic Commissioners, who should be allowed to carry out their duties free from political pressure. It had been his object in the London Passenger Transport Bill to combine the principle of public ownership with vigorous commercial management.

Rural Transformers

AT the last meeting of the 1931-32 session of the Overhead Lines Association on May 18th a draft specification for outdoor transformers for suburban and rural distribution, which has been prepared by the O.L.A. Transformer Committee, was discussed.

Mr. W. Fennell recalled the formation of the Committee, which is representative of manufacturers and users, two years ago. The principal aim had been to bridge the gap between maker and user, not to deal with materials, design or method of construction, which was the function of the British Standards Institution. The draft specification had been framed to meet working conditions and reduce manufacturing costs.

Proposed Standards

The following are the principal proposals put forward :—

Voltage, primary up to 11,000 V; secondary 230 V, 2-wire, *i.e.*, 230 V outer to neutral of one-phase three-wire or three-phase four-wire systems.

Sizes to be 5, 10, 25, 50, and 100 kVA single-phase, and 25, 50, and 100 kVA three-phase.

Temperature rise basis to be a maximum sustained ambient of 35 deg. C. in the daytime and 15 deg. C. in the evening in summer, and 5 deg. C. at the time of the heaviest load in winter. The rise to be based on an ambient temperature of 15 deg. C. and a maximum oil temperature of 90 deg. C., *i.e.*, a rise of 75 deg. C. maximum in oil and 85 deg. C. by resistance, to be determined in the same way as in B.S.S. 171, except that the full load is to be sustained for two hours only before temperatures are measured.

Regulation, expressed as a percentage drop of voltage, zero to full load at 75 deg. C. in oil, to be as follows :—

	5	10	25	50	100 kVA
	Unity power factor.				
Single-phase	2½	2	2	1¾	1½
Three-phase	—	—	2	1¾	1½
	85% power factor.				
Single-phase	3	2½	2½	2½	2
Three-phase	—	—	2½	2½	1¾

Tappings and Switches

Tappings to be on the high-voltage side in 2½ per cent. steps, one above and three below normal h.p. Externally operated tap switches to be fitted to all transformers of 50 kVA and over, to operate through the side (not the lid). Terminals, tanks, covers, paint, methods of fixing and lifting, and other accessories are also specified.

The draft proposals were discussed at some length, manufacturers' representatives expressing the view that the specification was almost the ideal. On the motion of Mr. R. J. Jocelyn Swan (president) the specification was adopted unanimously.

Assistance received by the O.L.A. Committee from the New Zealand Power Boards was gratefully acknowledged during the discussion.

Electricity Supply in the Argentine

THE Compania Italo-Argentina de Electricidad has issued a booklet describing its operations during the past twenty years. In 1912 it secured a fifty years' concession from the Buenos Aires municipal authorities for the supply of electricity for lighting, power, and traction in that city. The terms gave the city power, on certain terms, to take over the undertaking at the end of the period; otherwise the concession is to be extended for a further 25 years, during which time the municipality is to have a share in the profits, finally taking over the undertaking without any payment in 1987.

The supply in Buenos Aires was inaugurated in 1914 with a small station (Melo) of 1,500 kW capacity; this was succeeded in 1916 by the Pedro Mendoza station with three 8,250-kW turbo-generator sets, and four small Diesel-engined stations totalling about 5,000 h.p. for meeting sudden rise in load. The capacity of the Pedro Mendoza station had increased to 102,850 kW in 1927. Here three-phase 50-period supply is generated at 7,000 V, and it is converted to d.c.

Extension of Activities

When its sphere of operations was extended in 1926 the company secured a 50 years' concession for supplying the manufacturing town of Avellaneda, and two years later concessions for the towns of Quilmes and Lomar de Zamora, all in the Province of Buenos Aires, were secured. The four centres have a total population of about 2½ millions. Between 1914 and 1931 the number of consumers grew from 925 to 76,271.

As further extensions of the Pedro Mendoza plant were not possible, plans were put in hand in 1927 for a new super-power station; this is now being constructed at the new port of Buenos Aires, and it is named the Nuevo Puerto. The site is on the banks of the River La Plata and fuel will be brought by steamer. The buildings which are now being erected have been designed to take plant of an ultimate capacity of 350,000 kW, which may suffice for the demand during the term of the concessions.

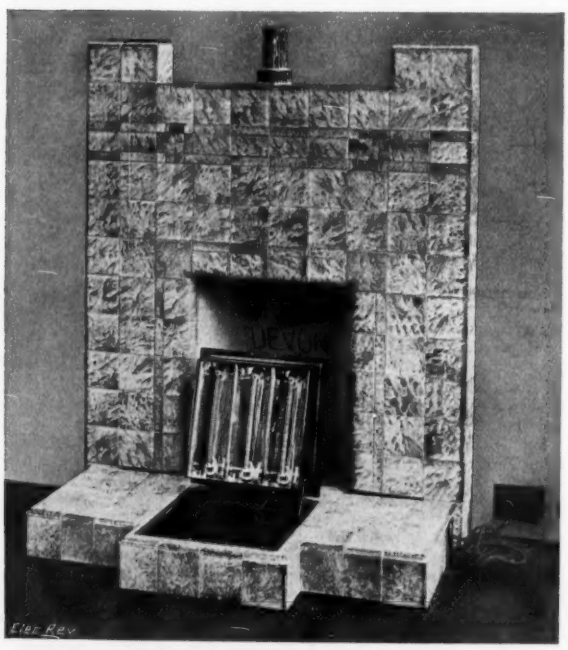
Unique Boiler Equipment

To begin with, there will be three 37,500-kW turbo-generator sets working with steam at a pressure of 38 atmospheres and a temperature of 450 deg. C. The boilers are being fitted for both coal and fuel oil firing, either of which can be brought into use without delay to take advantage of fluctuations in the market price of the two fuels and so secure the lowest steam-raising costs. There is to be accommodation for large supplies of both oil and coal.

As at the Pedro Mendoza station, three-phase, 50-cycle, 7,000-V power will be generated at Nuevo, this being stepped up for transmission purposes to 27,500 V and again stepped down to 7,000 V at various transforming stations.

In the near future the company will have 225,000-kW plant capacity.

Combined Coal and Electric Fire



"Devon" combined electric and coal fireplace, with hearth fire only

WE prefer all-electric to combined electric and coal heating, and we welcome the introduction of combined equipment for both methods of heating more from a coal-fire manufacturing concern than we would from an electrical manufacturer. The "Devon" combined coal and electric fireplace produced by Messrs. Candy & Co., Ltd., Devon House, 60, Berners Street, W.1, is essentially a standard "Devon" fireplace, with a slabbed and tiled surround and hearth as separate units in almost any combination of colouring, incorporating one or both of two electric fires, one in the hearth and one in the surround, in front of and above the coal fireplace proper, respectively. A copper box, 12½ in. square by 4½ in. deep, recessed in the hearth, accommodates a radiant reflector fire hinged to the back of the box, so that the fire back is actually the box lid, with a convenient handle. The back is filled in with tiles to match the hearth. When open the fire is inclined slightly backwards and supported by a hinged swinging arm between the fire proper and the box. It has three 1-kW plug-in vertical elements (nichrome spirals wound on fire-clay rods), each within a chromium-plated U-shape reflector, the whole being built into a copper frame.

One-heat control only is employed direct from the skirting-board switch-plug, but a switch attached to the frame under the fire (at the back when the box is closed) acts as an additional safety control. When the first is lowered the switch handle catches on an internal projection from the back of the box and is automatically tripped. There is a bushed cable entry at one side of the hearth, and a similar bushing in a recess at the back of the box. Suitable flexible lead is employed between the fixed and movable parts of the equipment. The surround fire, not contained in the model we saw, is loaded at 1 kW, and has the usual fire-clay slab-type element. Presumably the cable entry for this is at the side of the surround, similar to that of the hearth fire. This fire is fixed, recessed into the surround, and covered in when not in use by two hinged doors backed with tiles to match the surround. The surround dimensions are 40 in. by 48½ in. high.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Is the National Register a Failure?

With regard to Mr. Falshaw's letter under this heading in your issue of April 29th, the number of contractors on the National Register in Manchester in comparison with other towns must not be wondered at, when one appreciates the fact that the Manchester Electricity Department has a permanent register of electrical contractors.

No additions are made to this list unless the contractor is already on the Register. Failing this, an ordinary contractor cannot do assisted wiring at all, and I understand that in all cases consumers are advised to allow no work to be done except by authorised contractors. This results in the maintenance of certain standards of workmanship and materials, and keeps out the illegitimate competition so detrimental to the industry as a whole. The trouble is, that this only applies to the assisted scheme and cooker wiring.

When Manchester and other large towns, and preferably all supply companies and departments, obtain power to extend this method to all work done on their area, they themselves will have less trouble and the status of the trade generally will be improved. I believe Manchester has a Bill for this purpose under consideration at the moment.

In my opinion the National Register is worthy of more support from the majority of supply authorities, as the time was never more ripe for closer co-operation between them. For other towns to follow Manchester's example would be a good start, and would be to their advantage as well as helping all bona-fide contractors.

GEORGE S. BUTLER.

Wilmslow, Ches., *May 18th*, 1932.

E.H.P. Switchgear

With reference to Mr. H. F. Yelland's interesting article on "E.h.p. Switchgear" in your last week's issue, until some two or three years ago there did exist a real difficulty in buying switchgear on the same terms as other electrical plant, *i.e.*, on guaranteed performance, but such is not now the case. The purchaser may buy switchgear proved by test under conditions actually more severe than those obtaining in actual service, and the factor of safety of the apparatus under the most severe conditions can be ascertained. There is much in Mr. Yelland's article which will be really useful to buyers of switchgear, but surely it is wrong to lead the purchaser to believe that there is to-day "the impossibility of obtaining figures of efficiency" and "an absence of that data which forms a useful guide in the selection of other plant."

It is also being appreciated by those engaged in circuit-breaker testing and research that, whilst a study of the physical dimensions of a particular breaker *may* serve as a very approximate guide to its performance under short-circuit conditions, there is a "balance of design" which is only achieved by countless trials and tests on the short-circuit test-bed, which to-day represents the only certain criterion of circuit-breaker ability.

L. J. BAMBER.

Manchester, *May 21st*, 1932.

Power in Industry

Many of your readers are, no doubt, watching with interest the figures for 1930 relating to power in industry published bi-weekly as a supplement to the *Board of Trade Journal*.

The amount of power which is transmitted electrically has increased in nearly all the trades so far published, but the change-over from mechanical-drive can only be termed gradual.

One example from the cotton trade may induce the people concerned to look more deeply into the matter.

POWER AVAILABLE IN THOUSANDS OF H.P.

	1912.	1930.
Power applied mechanically ...	1,310	1,016
Power applied electrically ...	76	370
Total power	1,386	1,386

It is certainly remarkable that after 18 years the figure (1,386,000 h.p.) should remain the same.

STATISTICIAN.

May 21st, 1932.

Earthing in Rural Areas

With reference to Mr. T. C. Gilbert's article in your issue of April 22nd and to Mr. Stimson's letter in your issue of April 29th, it may interest your readers to learn of some of the methods adopted for earthing in rural areas in Egypt. As articles in your columns have reported, some 380 and 115 km. of 66-kV overhead lines are being constructed in North Delta and in the Assuan Province in Upper Egypt, respectively.

In the latter case the standard method is to connect all metal work on the towers to c.i. pipes two metres long, 15 cm. in external diameter, and 1½ cm. thick. These pipes are buried vertically in the soil and surrounded by a 15-cm. layer of finely divided coke, the centre line being about one metre from the nearest part of the concrete foundation, and in such a position as to ensure its being always surrounded by damp earth. Each pipe is fitted with two 50-sq. cm. tinned copper connecting pieces, protected from corrosion by lead covering. The lines run for most of their route parallel to the River Nile in cultivated land, but there are parts where earthing is difficult, *e.g.*, in desert reaches about 16 km. in length and 2 km. from the Nile, and in rocky places near the Nile, where different methods are called for.

In the desert reaches made up of sand, gravel and stony ground, damp earth can be met with only at depths of from 10 to 20 metres. In order to determine the resistance of the ground we have sunk a pipe, surrounded by coke, in the normal way and measured its earth resistance. This was found to be more than 250 ohms—the maximum that could be measured with the apparatus used.

Three of the methods tried for the purpose of overcoming this difficulty were: (1) Driving steel pipes at every second tower to a depth of from 10 to 20 metres; (2) laying a copper cable in the ground and connecting it to the towers and to a low-resistance earth at both ends of the lines at the termination of the desert reaches; and (3) using cadmium copper instead of steel as the earth conductor and connecting it to four pipes (each connected to one leg of the strain tower) at each end of the line. The third method has proved the most economical and the best technically.

In the rocky reaches, where no damp soil can be found near the towers, good earthing can be obtained by placing the pipes in the Nile water and using 20 to 30-metre connecting cables.

S. A. ASHMAWY.

Cairo, *May 10th*, 1932.

Power Factor Improvement

We have noticed the article on "Motor Control and Power Factor" by Mr. D. Dyson Rayner in your issue of 20th inst., and find that the particulars there given apply with great accuracy to our "Lokaveay" motor, protected by our British Patents Nos. 220,652, 253,113, and 371,957. A brief description of our "Lokaveay" motor appeared in your issue of July 3rd, 1931. These motors have been on the market for upwards of eighteen months. It appears that Mr. Rayner has re-discovered the advantages of our invention, in ignorance of our work upon it.

THE ELECTRIC CONSTRUCTION CO., LTD.
James Gray, *Managing Director*.

London, W.C.2, *May 24th*, 1932.

Shoddy Motor Winding

Recently I was called to one of my customers (who was aware that I have had considerable electrical experience) to give my opinion on his potato washer, which had broken down after only five months' running for one hour per day. I was able to say from the symptoms that there was an open circuit in the field circuit, and advised him to get into touch with the makers, under the usual terms of unsatisfactory service. They advised him to send the machine in, and they would put this right free of cost if it was bad material or workmanship. On his doing so they claimed that water was responsible, and the charge would be 29s.

I then advised him to claim the coil taken from the machine which is foreign. The quality of the black Empire tape used is quite satisfactory, but this is useless if not applied correctly. Next the yoke the tape is slack, and was evidently so in the machine, and there was verdigris on wire at this point.

I may say that my interest in this matter was quite voluntary in the first place, this developing into indignation at the treatment of my customer (for ice), who has lost faith in electrical machines, and no wonder, with the wretched conglomeration of iron, copper, &c., put on the market as machines, and I quite frankly state that as an old electrical man I hang my head in shame at my late industry.

You may answer this in the ELECTRICAL REVIEW if you desire, as I still keep in touch with the industry through its agency. Before concluding, I must point out that these motors are supplied to a firm to mount on their machines, with all knowledge of the condition of service under which they run.

Incidentally, I may say that I found the earth clip on tubing slack and over the enamel, and not connected to earth terminal, and the machine mounted on wooden blocks, this work by an electrician; and my customer looked aghast and doubtful when I told him not to use the machine until put right, which would still run (fast) on series coils.

Per pro G. G. MARTINALI.
F. Harrison, *Manager*.

Southend-on-Sea, *May 14th*, 1932.

Earthing of Apparatus

That Mr. F. L. Best or any other ELECTRICAL REVIEW correspondent should need an introduction to an "earthed" electric iron seems incredible, but on reflection I have yet to see the supply cutouts and meters earthed, and these articles are not sold and fitted by drapery stores and other amateurs.

L. E. WILSON.

Manchester, *May 23rd*, 1932.

The B.B.C.'s Latest Station

A description of the new Falkirk transmitter

THE new Scottish regional transmitter of the British Broadcasting Corporation at Westerglen, Falkirk, is about to come into regular service on a wavelength of 376.4 metres.

It will eventually take the place of the Glasgow, Edinburgh, and Dundee stations, and its importance is indicated by the fact that 80 per cent. of the total population of Scotland is within an 80-miles radius of the new transmitter, which is 500 ft. above sea level.

Visitors to the Faraday Centenary Exhibition in September will remember the transmitting units which were on show in the Albert Hall. They are now reassembled at Westerglen, together with the similar units of the national set. The two face each other with their respective power control units between them, the layout of the station being practically similar to those at Brookman's Park and north regional stations.

A 25-panel power distributing switchboard is ranged along the far end of the hall. The units are built up on aluminium frameworks, with glass panelled doors in front, and consist of unit A, containing the master oscillator, which generates the carrier frequency, stabilised by being driven from an independent source and with a separator valve between it and the modulator, the modulated amplifier circuits; unit B, the first power amplifier, a medium powered push-pull high-frequency amplifier; units C_1 and C_2 the final high power push-pull h.f. amplifier; unit D, fitted between the C units, contains the tuning and coupling circuits for the final power stage. The valves in units B, C_1 and C_2 are water cooled.

The overall frequency response curve of the transmitter is flat over a range extending from 140 to 2,500 cycles per second, falling off gradually to 50 at one end of the spectrum and to 8,000 at the other. Spare valves are fitted on the circuits and can be quickly brought into use in the event of a working failure. Each cubicle is locked and when unlocked all power supplies are automatically cut off.

The transmitter hall of the new station

The Aerial System

An aerial feeder line, about 300 yards long, built up to a characteristic impedance of 500 ohms with a termination of equal value, carries the output to the aerial transformer house near the base of the mast. The national feeder line is not yet erected. The aerial system consists of a triangular lattice steel mast, 500 feet high, for each transmitter.

Each mast carries three nearly vertical aerial conductors, spaced 120 deg. apart, the lower ends being anchored through insulators to concrete blocks about 50 yards from the base of the mast. Each conductor is then led nearly horizontally to the aerial transformer house. The earth system consists of bare No. 16 S.W.G. copper wires, spaced radially every 5 deg. from the base of the mast and buried under the turf to a distance of 235 feet outwards.

Although the Central Scotland grid power transmission line passes within a quarter of a mile of the station, no use is made of it, the d.c. power required being generated by four Diesel Crossley engines (described in last week's ELECTRICAL REVIEW) coupled direct to d.c. generators, each developing 1,065 A at 230 V. There is also a standby storage battery consisting of 115 Alton cells of 2,000-Ah capacity at a 10-hours' discharge rate.

The power developed is used to drive motor generators which produce the voltages for the various requirements. Three machines have four commutators, each generating 3,000 V and connected in series to give the 12,000 V required for the anodes of the transmitting valves. The output of each machine is 16 A at 12,000 V, the efficiency being 82 per cent. Their output is carried through a 5-Henry choke with a 36μF condenser across to get rid of commutator ripple. For the supply of filament current there are three generators each capable of an output of 1,300 A at 20 V. Three grid-bias motor generators are provided, each of which is terminated on a resistance, the final grid bias adjustments being made on the potentiometer principle from these resistances.

A studio has been included in reserve, the station being connected to Edinburgh by four telephone music pairs, which terminate on a switchboard in the control room where are also correcting networks and controls necessary for the monitoring of programmes. A separate control room will regulate the national programme when that transmitter is completed. The national wave-length will be 288.5 metres; Aberdeen will be reduced to 214 metres.

The following is a list of the principal contractors:—Diesel engines and auxiliary plant, Crossley Bros., Ltd.; engine-driven generators and booster sets, British Thomson-Houston Co., Ltd.; power house switchboard, Whipp & Bourne, Ltd.; storage batteries, Alton Battery Co., Ltd.; high voltage and filament current motor-generator sets, English Electric Co., Ltd.; transmitter hall and machine room switchboards, English Electric Co., Ltd.; small high voltage and grid-bias motor-generator sets, Haslam & Newton, Ltd.; high voltage smoothing condensers, Telegraph Condenser Co., Ltd.; high voltage smoothing chokes, Ferranti, Ltd., and Johnson & Phillips, Ltd.; transmitters, Marconi's Wireless Telegraph Co., Ltd.; wiring and cable work, R. M. Russell, Ltd.; inter-communication telephones, Reliance Telephone Co., Ltd.; masts, Radio Communication Co., Ltd.; aerials, Marconi's Wireless Telegraph Co., Ltd.; heating and valve cooling installation, Rosser and Russell, Ltd.; control battery charging motor-generator sets and switchboard, English Electric Co., Ltd.

Paper-insulated Cables for Vertical Positions

THE I.E.E. Regulations for the Electrical Equipment of Buildings permit the use of paper-insulated cables of the following types: (a) plain lead (or lead alloy) covered; (b) lead covered as in (a) and bedded and armoured with or without serving or braiding over the armour.

Where mains have to be installed in vertical positions indoors, as in lift shafts, or in places where they are subjected to high ambient temperatures, *e.g.*, boiler houses, paper-insulated cables of the drained type are most suitable. This type has the minimum of free impregnating compound in the insulation; consequently, under the conditions met with in the ordinary way there is no risk of "bleeding" (impregnating compound making its way out through the termination). Cable of this type up to 11-kV working pressure has been in operation in indoor installations and in mine shafts for many years.

A special type of drained cable has been developed for working pressures not exceeding 3.3 kV by British Insulated Cables, Ltd., for which it is claimed that no compound will bleed, even when the conductor is at a temperature of 185 deg. F.

This type of cable can be installed in *dry* situations in buildings without compound-filled terminating boxes; the cable can be terminated by well soldering the connecting lugs to the conductor, the strands of which are also well and solidly sweated together. The cores should be given a good coat of quick-drying insulating varnish and then be well lapped with varnished cambric tape—the tape being brought well over the sweated portion of the conductor, and also over the open end of the lead sheath. The taped-up end of the cable should then be given two coats of quick-drying insulating varnish.

Lead alloy sheaths are recommended where the cable is liable to be subjected to vibration. The addition of a small percentage of either antimony or tin strengthens the sheath and renders it more resistant to the effect of high frequency vibration. For very severe conditions a ternary alloy of lead, tin, and cadmium is used. Armoured cables can be supplied with beddings and servings which contain the minimum of free impregnating compound, so that the risk of the compound dripping under normal conditions is remote.

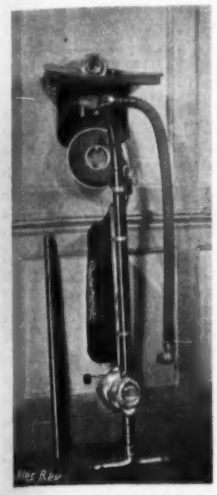
For special conditions, such as high ambient temperatures indoors, where armoured cable is required, the bedding should consist of two layers of drained compounded paper, and no serving should be applied over the armour. This type of finish can be painted after erection without any fear of the paint becoming discoloured by compound leaking out.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Novel Vacuum Cleaner

An unorthodox vacuum cleaner has recently been marketed by PNEUMODE, LTD., 106, Regent Street, W.1. It has an easily removable fibre container in place of the usual dust bag. The container, when used, can be thrown away and replaced by a new one; twelve are provided with the cleaner. A small window is provided to enable the user to see whether the cleaner is functioning efficiently, and this is combined with a valve to control the direction of suction, either through the cleaning nozzle or through the hollow handle. The cleaning nozzle is self-adjusting, and is sprung on to the wheels.



"Pneumode" cleaner.

To avoid the encumbrance of heavy lengths of flex a separate cord reel has been provided, from which the correct amount of flex may be pulled. The handle is provided with a swivel joint action, which facilitates handling in restricted space. A wall bracket is obtainable for storing the cleaner, which can be used by means of the hose for cleaning hats and clothes while still connected to the wall bracket. The weight is 8lb.

A New Torchière Floor Standard

Messrs. MORTIMER, GALL & CO., LTD., 26, Cheapside, E.C.2, are supplying a range of new torchière floor standards in various artistic designs, the light of which is claimed by the makers to be almost shadowless. The illustration shows a standard model which can be obtained in bronze, verde antique and other finishes. Special designs are supplied to order.

A Torchière floor standard

Improved Electric Kettles

The automatic electric kettles marketed by the EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4, have been entirely redesigned, resulting in an improvement in shape and efficiency. The elements are smaller, raising the loading per sq. in. from 6.3 W to 9.8 W, while a new rustless spring steel pressure plate of curved section ensures an even pressure over the whole surface of the element. The connector is made of specially moulded heat resisting material fitted with a rubber sleeve in place of the usual wire spring, thus guarding against short circuits at this point.

A Novel Electric Iron

The outstanding feature of the new "Revo" electric iron is the thermometer which is embodied in it. The indicator is about the size of a penny, and fits on the top of the cover between the two bolts holding down the handle and the stirrup. The operation is controlled by the expansion and contraction of a bi-metal coil. The dial of the indicator (which only registers and does not control the heat) is not marked in degrees but has five divisions, for wools, art silks, pure silks, cottons, and starched materials. The iron is made by THE REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton.

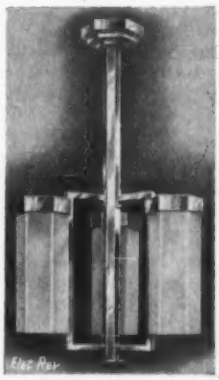
The "Revo" temperature-indicating iron

A New Brazing Alloy

The "Sil-Fos" brazing alloy, now being manufactured by Messrs. JOHNSON, MATTHEY & CO., LTD., 73-82, Hatton Garden, E.C.1, contains a small percentage of silver. It has a low melting point, 1,300° F., and is very free flowing. The maker's laboratory tests on copper to copper lap joints without the use of flux have shown an average tensile strength of 33,000 lb. per sq. in. with an elongation of 17.2 per cent. in two inches. The alloy can be used with almost any non-ferrous metal or alloy fusing above 1,300 deg. F.

Modern Lighting Fittings

A range of new lighting fittings is being marketed by the 20TH CENTURY ELECTRICAL, 30, Gerrard Street, W.1. The fittings, which are of brass, are well finished in good quality chromium plating, and are available in many distinctive designs, both as pendants and wall fittings. There is also a number of new designs in table lamps, the appearance of which is considerably improved by the use of new multi-coloured flexibles to blend with the general colour scheme which the firm has recently introduced.



"20th Century" fitting.

A New Fire Element

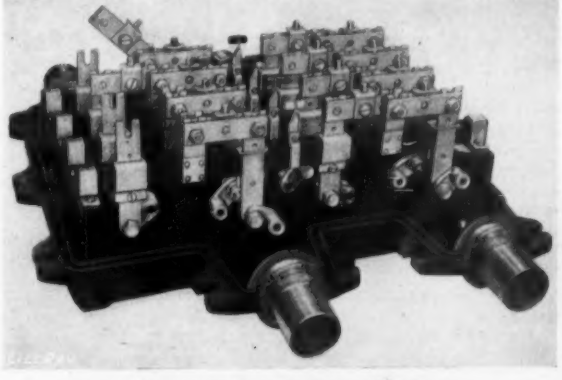
A new wire-wound element for the company's fires is now being marketed by FERRANTI, LTD., Hollinwood, Lancs. No tools are required for fitting, and it is easily interchangeable with the older type bars. The loading is 1.2 kW for any voltage and the temperature uniform throughout its entire length.

Improved Link Disconnecting Boxes

A number of new features are embodied in the low-voltage link disconnecting boxes which MESSRS. SIEMENS BROS. & CO., LTD., Woolwich, are placing on the market. The rotating cable sockets, which are drilled through, allowing adjustment if the cores are cut too long, enable the cable cores to be connected to their respective phase bus bars with very little bending; this allows the dimensions of the box to be reduced considerably. Each bus bar forms a support for the cable fittings of that phase and is covered with bakelised paper insulation, except at the points of electrical connection. Normally, when the links are in position, this insulation is not under stress, except at the ends where extra insulation in the form of a bakelised cap is provided. When installed, the entire insulated bus bar is under compound. In the straight-through boxes the cable fittings are carried on insulated supports of mild steel instead of bus bars.

Each spring link is double-bladed with a spring washer connected between the blades at the centre, and at each end there is a stud fitted with a spring washer and nut. This arrangement permits easy adjustment, a spring contact being combined with a bolted contact. Insulated keys for withdrawing the links and insulated spanners are provided. All the fittings are tinned and are made from h.c. copper, except the cable sockets, which are of cast brass. Ebonite screens separate and surround the parts of the phase fittings above the compound and dip slightly into the compound. Coloured phase indicators are provided, and brass wiping glands or cable grip entries with compound pockets can be supplied. A diving bell lid is fitted.

A test of 3 kV is applied to all boxes, which can be supplied with "Zed" fuses up to 700 A. The standard types of



The new Siemens disconnecting box

boxes are made for three-core and four-core cable, two-way, three-way or four-way, straight through or with side entry, and for conductors of 0.15, 0.3, and 0.5 sq. in. respectively. A three-way, three-core box for 0.3 sq. in. requires a frame and cover with a daylight opening of only 18 in. by 18 in.

Estimating and Profits. By A. W. Willsmore, F.R.Econ.S.

The proper appreciation of fundamental costs

IN any industry operating on a special order or contract basis there must be a relationship between the relative efficiency of the estimating systems used by the individual competitive firms and the net profit results which they achieve. Efficient estimating, by providing for the determination of optimum selling prices, is the key to maximum net profits. This is a characteristic feature of both small and large companies.

The practical importance of the determination of selling prices will be apparent. If a quotation against an inquiry is fixed too low, potential net profits are lost; if too high, the order is lost. There is a right price for every order, and maximum net profits can be ensured only by determining what this price should be. Accurate cost estimating is essential towards this end, but the cost estimates must be employed intelligently.

Efficient Estimating

Successful estimating does not imply merely an accurate forecast of costs against a particular inquiry to serve as the basis for the determination of a selling price by the addition of standard profit margins. Market conditions must be taken into account, and it is often expedient to depart in a measure from the standard text book attitude towards "advance costing."

Broadly speaking, the process of preparing an estimate against a particular inquiry involves:—(*a*) Analysing the inquiry to see what is involved, or "sizing up the job"; (*b*) Estimating the cost of materials, labour and purchased parts involved; (*c*) Adding loadings to cover overhead expense (including commercial expense and selling expense); (*d*) Adding profit to determine final selling price.

It is on (*c*) and (*d*) that the efficiency of the estimating system is put to the test. The practice of adding standard percentages to cover these items may prove satisfactory when orders are plentiful and there is no competition; but in periods of reduced activity it is quite unsuitable. The pricing and estimating systems must be flexible so that prices can be adjusted to market conditions.

Recovery of Fixed Charges

In any business, small or large, there are expenses that must be incurred irrespective of the volume of work that is handled: rent is perhaps the best example. The existence of these fixed charges is an essential fact to be borne in mind in figuring quotations. Normally, they should all be recovered in selling prices together with a margin sufficient to yield a fair profit. In abnormal times, however, it may be advisable to take a job at a price which does not show a normal profit but which nevertheless offers a valuable contribution to fixed overhead expenses.

Of course, I am not advocating a price-cutting policy for operating business on the basis of a minimum net profit; the importance of earning adequate profits is fully appreciated. The whole point is that there are times when it will pay to take an order at a small profit or even at a nominal loss rather than not to take the order and incur a larger loss through inactivity. The business man whose estimating system is not sufficiently elastic to indicate how far he can afford to quote what the market will stand cannot hope to secure the best results. This applies particularly to export orders. Sceptics will challenge the contention that it may be profitable to take an individual order at a loss, but many examples might be cited to establish the soundness of the proposition.

Treatment of Special Cases

The policy of taking business on this basis represents a case of the choice of two evils; obviously it cannot be followed on every order. But if conditions are temporarily such that a lack of business increases competition to a degree in which normal prices are out of the question, the business man must be guided by some such line of thought. The existence of conditions where lack of balance between supply and demand implies an impossibility of securing reasonable prices may be deplored, but facts must be faced. It is not a question of price-cutting but one of adopting special steps to meet special circumstances.

It has been assumed that the contractor is not making any profit in the purchase and reselling of materials, supplies and fittings. If, in fact, the cost figure at which these items are included in the estimate implies a profit to the contractor this fact must be taken into consideration in putting forward a "rock-bottom" bid.

The line of policy must be to quote on the basis of a normal profit if possible; but if this is impossible, quote on the basis of a figure that will give the greatest possible contribution to overhead expense in the circumstances that may be ruling. In the case of a manufacturing unit there are expenses that must be met irrespective of activity, and a policy of "loss prevention" must be followed in abnormal times.

Unit cost in manufacturing industry, of course, decreases up to a point as output increases. This is only another way of reflecting the significance of overhead expense. The larger the volume of output, the smaller will be the proportion of overhead expense that must be earned on each unit of output. The trouble is that if the total volume of business is restricted and if one individual manufacturer commences to cut his prices to secure an increased share, his example is likely to be followed by his competitors, resulting in a situation where he finds himself still securing the same volume of output as before but at a lower price. In the circumstances, the tendency is towards maintaining normal selling prices for domestic business and quoting lower prices on overseas inquiries. Is this a wise policy and is it fair to the domestic consumer?

As to the fairness of the policy, it must be admitted that the manufacturer has a right to expect a reasonable price for his articles, and it cannot be argued with justification that the fact that the manufacturer sells "below cost" abroad implies that he should sell at the same price at home. Neither does it follow that the low prices in export trade imply higher than normal prices in home trade to make up for any loss that may be involved. On the contrary, it can be proved that the low prices in foreign trade actually allow lower prices to be quoted for home orders than would be the case if no such attempt were made to secure additional business.

Volume and Price

Assume, for instance, that a manufacturer has overhead expenses of £120,000 and that he is selling an article which costs £3,500 for direct labour and material. If the manufacturer sells fifty units a year the amount of overhead expense to be recovered from each unit works out at £2,400 per unit, so that if he sells this output at £6,000 per unit he makes a profit of £100 per unit, or £5,000 all told. Now assume that the total volume of business has declined so that a sale of only forty units can be expected. On this basis, the amount of overhead expense to be recovered against each unit is £3,000, making a total cost of £6,500. Obviously, to make the same profit as before the manufacturer would have to charge a price of £6,625 per unit compared with the previous figure of £6,000. Assume further that the manufacturer has an opportunity to dispose of an additional twenty units abroad at a price of £5,500. If he took this order he would make a profit of £20,000 as follows:—

Overhead expense	£120,000
Material and labour, 60 units at £3,500	210,000
Total cost	£330,000
40 units at £6,000	£240,000
20 units at £5,500	110,000
Total income	£350,000

If the same total profit of £5,000 was to be maintained, the home price could be reduced to less than the original figure. The conclusion is obvious. If the manufacturer does not cut prices to secure foreign business he must make a loss on his home business. If he does cut his price he can maintain the same profit as before with a lower home price than that originally necessary. The example chosen as an illustration is, of course, hypothetical and may not line up with actual circumstance. There remains, however, the fundamental principle that quotations and selling prices must be based on a true appreciation of fundamental costs rather than on inflexible standard profit margins.

The Future of Television

A PAPER on "Seven Years' Experimental Research and Investigation of Television" was read recently by Mr. R. W. Corkling before the Television Society. He confessed that the mechanical methods used by Baird and others had produced results which had surpassed his expectations. In spite of the larger field of vision now being transmitted, the received image still remained small, this being determined by the dimensions of the disc. Larger images could be obtained by means of projection, but the standard neon lamp did not provide sufficient illumination for this. Therefore the expense would prohibit this method being used for home reception. He considered that, with the exception of possible detail improvements, this method had reached its practical limit.

He tried to show that notwithstanding the vast amount of excellent work that had been done during the last few years it must be agreed that television had not yet "arrived." It was possible to transmit and receive limited vision of events in action, but the position was similar to the coherer days of wireless; the equivalent of the thermionic valve, was needed. Mechanical methods would ultimately give way, at least at the receiving end, to a better method of synchronisation. The author was at present devoting his attention to the possibility of electro-chemical applications.

English Engineers and Canada. From Our Special Correspondent

AN English professor on the staff of the University of Toronto recently published an article on "The Possible Markets in Canada for the Products of British Mechanical Engineers" containing a number of statements which are equally of interest to electrical engineers. The views are similar to those that have appeared on various occasions in the ELECTRICAL REVIEW.

The writer pointed out that Canadians generally were viewing with considerable regret the gradual Americanisation of their country and the alienation of its vast resources. Practically all standards, "including such fundamental ones as screw-threads, are American, and test codes and methods of procedure are almost invariably those of the United States." He added: "British manufacturers are very largely to blame for this, because in the past they have been satisfied to leave their business very much in the hands of agents."

I will quote further: "Manufacturers must be prepared to undertake far more of the onus of selling and servicing their products than they have done in the past. Canadian technical papers are full of American material, articles, &c., but have very little similar information from the United Kingdom. A very great deal of business has been placed with the United States frequently because United States' development engineers were employed . . . but often, too, because engineers were not acquainted with what was produced in the United Kingdom."

It appears that in recent years many Canadian manufacturers when wishing to produce a particular line of goods have gone to the United States to study the plant in a factory making a similar product, and have ordered similar equipment. This, of course, has meant that British manufacturers have had no chance to compete. I see that the matter has been taken up by one of the English engineering papers.

Why Not an I.E.E. Visit?

The Institution of Mechanical Engineers has arranged for some of its members to visit Canada next August and to be in Toronto for the Canadian National Exhibition. Is there, then, any good reason why, say, next year the I.E.E. could not organise a similar visit?

There is a great deal in this country to interest electrical engineers—the great actual and potential hydro-electric developments; the pulp and paper, mining and other industries which provide large markets for electric power; the widespread domestic use of electricity in both town and country; the long transmission distances and high voltages—these are all features of electrical development here which will command the attention of British electrical men, be they manufacturers, supply engineers, or anything else electrical.

I have always felt that the I.E.E. has neglected this Dominion. One feels in Canada as though the only thing to do is to give up one's connection with the I.E.E. and join the A.I.E.E. instead. The latter body has active branches in all the larger centres in Canada and the total Canadian membership must be considerable. The I.E.E., on the other hand, is totally inactive, its Canadian members as such are largely unknown to each other, and they are probably few in number since on arrival here they are promptly forgotten at I.E.E. headquarters and abandoned to their fate. It would be very interesting to know how many scores of British members have after arrival here dropped their I.E.E. connection in favour of membership in the American Institute.

A Suggestion to Electrical Societies

Now that electrical engineering practice in the United Kingdom more nearly resembles (in size of equipment, voltage, and transmission distances) that on this continent, I believe that it would be a good thing if all the engineering and technical societies at home would adopt a policy of sending copies of important papers likely to be of interest here to the technical Press of Canada. Such material coming from a society would probably command more attention than anything sent out by some interested firm or individual.

In some quarters the pages of the *Journal* of the I.E.E., for example, are examined much more closely to-day than was the case five or ten years ago. If, however, papers, or good abstracts of them, were available here nearly at the same time when they were being read we might see a little more British engineering literature and a little less of the great quantity that now comes from the United States.

One of the daily newspapers here has a slogan which runs: "Read it in the —— while it's news." Let us have the most recent British engineering literature in Canada "while it's news."

The Belgian Market

A review of the present position

IN a Department of Overseas Trade report on the economic conditions in Belgium in 1931 (Stationery Office, 3s. 6d.), Mr. N. S. Reyntiens, Commercial Secretary to the British Embassy at Brussels, indicates that while the country has suffered from the general critical conditions, her position is favourable as compared with other countries. The gold standard has been maintained, the gold cover held against currency is high, and the Government Budgetary policy is designed to avoid any extensive deficit.

Industry and trade have not been immune from the general depression, and the various restrictive measures imposed in her export markets have had a serious repercussion on many of the Belgian industrial enterprises. Manufacturers of electrical apparatus have been seriously affected, but during the first part of last year many back orders remained to be executed and kept the factories busy for a time; later, orders did not continue to come in, and at the end of the period under review many firms were working at a loss.

Imports and Exports

Exports felt the effect of the great efforts being made by foreign competitors, and the fall in sterling led to heavy losses. Wages have been reduced several times, and the general outlook is decidedly gloomy. An idea of the trend of trade may be obtained by a perusal of the statistics published in our issue of May 13th (p. 712).

During the past year German radio receivers have found a largely increased sale, while purchases of British sets have diminished almost to vanishing point. It is stated that German radio apparatus is approximately 45 per cent. cheaper than British, and although this comparison is made on purchases prior to the departure of the United Kingdom from the gold standard, the prices are still much in Germany's favour.

Long-term credits are offered, one German firm allowing twenty-five months' credit on any of its receivers. Similarly a Belgian firm offers a popular model on instalment plans, which work out at about 4s. a week at the present rate of exchange.

Most radio firms are prepared to give free demonstrations in the homes of prospective customers, and guarantees are usually given for one or two years.

British loudspeakers and transformers, which formerly found a fair sale, have been less in evidence, but there appear to be signs of improvement in this direction.

It is reported that importers of American radio receivers and apparatus are showing a greatly increased activity, and various sets are being offered at prices considerably below those of comparable European makes.

The Electricity Supply Industry

The electricity supply industry has not entirely escaped the evil influence of the economic crisis. In some districts it has caused a decrease in the consumption of electric power for industrial purposes. It is, however, difficult at present to estimate the effect of these circumstances on the industry in general, for, whatever reductions may have been made by individual consumers have been counterbalanced by the increased area served.

No new central power stations have been erected, but many of the existing ones have been considerably enlarged. Great progress was made in the Liège district by arranging for an interchange of power between various generating stations.

The reduction in the price of coal and wages has brought about a corresponding decrease in the price of electricity. It is impossible to give the exact price for lighting supplies, the prices varying considerably according to commune, from 1.25 to 5 francs. The price of low-voltage motive power is generally half that paid for lighting purposes. For high-voltage motive power the average price varies between 0.20 to 0.70 francs.

The distributing system is still undergoing considerable and constant extensions, as numerous communes have obtained this advantage from their concessionnaires in exchange for a readjustment of tariffs to a level corresponding to present economic conditions.

Rural Electrification

In spite of the crisis electrification of the countryside continues to make great progress, and in November, 1931, there were only about 150 communes in Belgium in which the principal districts did not possess a system of electrical distribution. The electrification of villages and isolated farms continues, and practically all rural houses within reach of a supply are now provided with electric lighting.

On the larger and medium-sized farms, the farmers are gradually coming to use electricity for driving their machines. The employment of big, electrically driven threshing machines is still rare; and electric ploughing is unknown, largely owing to the smallness of the farms.

In small scale farming, there is a widespread use of separators, churns and washing machines. Electric heating apparatus is little used, but the electric lighting of fowl-houses is progressing. In larger farms, electrically driven milking machines are coming into use, and a considerable number of farmers do their milling electrically.

Communications

A total of 10,069 km. of telegraph lines was in use at February 28th, 1931, but no further lines are either under construction or to be constructed.

At September 30th last there were 227,363 subscribers (117,205 automatic) an increase of 7,296 as compared with the preceding year. The length of inland lines to be constructed amounted to 151 km. and international lines to 139 km. The length of underground cables on February 28th, 1931, was 1,478,900 km. A good deal of progress has been made with the development of the international telephone and radio-telephone services.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

A Battery Jubilee

On Tuesday, June 7th, and the following day, the fiftieth anniversary of the foundation of the Electrical Power Storage Company will be celebrated by a visit to the works at Dagenham of Messrs. Pritchett and Gold and E.P.S. Co., Ltd., and a luncheon at the Dorchester Hotel, Park Lane, W. At the luncheon, which will be held on June 8th, Sir Archibald Gold, D.L., the chairman of the company, will preside, and Sir Hugo Hirst, Bt., chairman of the General Electric Co., Ltd., who had part of his early training at Millwall, will speak. Others likely to be present include Sir Oliver Lodge, who was consulting engineer to the E.P.S. Co. for many years.

Prince George's Visit

H.R.H. Prince George recently paid an informal visit to the company's works. He was accompanied by an official from the Factory Department of the Home Office, and was conducted round the works by Mr. G. R. N. Minchin, one of the managing directors, and Mr. Cyril Pritchett, the works manager. The Prince showed the keenest interest in all he saw, particularly in the provisions made for the health of the workers.

The Contractors' Convention

At the E.C.A. Southport Conference in June, papers will be read as follows:—"Looking Forward: The Trend of Trade," by Mr. Howard Marryat, M.I.E.E. (past president;) and "Installation Problems Old and New," by Mr. R. Harrison-Watson, M.I.E.E.

An Interesting Window Display

Something different in the way of window displays is shown in the accompanying illustration. Except in the smaller of the two sections there has been hardly any attempt at the realisation of any direct sales results. The principal display aims at interesting and educating the general public in matters of electricity supply. The central feature is a large panel headed "How electricity comes to you." A series of concisely worded paragraphs deals in turn with the power station, the transformer station, the distribution network, the service connection, &c., and finally the connection to the appliance, each paragraph being decorated with a relevant illustration and diagram representing the essential features. Numbers on this chart correspond to similarly numbered exhibits and are linked up by coloured tapes to a display of high-tension terminal boxes, typical link disconnecting boxes, a full-size unit-type distribution pillar, service boxes, &c., while samples of cables are displayed in easel-type panels. Two further panels represent the "Henley" wiring system and "Thermoid" flexible cord. This section of the display is completed by a life-size figure of a typical housewife wielding her electric iron. The "Solon" display in the right-hand section of the window is mainly a selling display. Two moving signs catch the eye of the passer-by, while in the foreground are a few repair and constructional jobs done with this handy tool. The whole of this display is at present being exhibited in the various showrooms of the Shropshire, Worcestershire and Staffordshire Electric Power Co., passing from one to another after about a fortnight's display.

A new kind of educational window display now being exhibited in the S.W. & S. Co.'s showrooms.

The Food Exhibition

The National Grocery and Provisions Exhibition, under the name of the "All-British and Empire Food Exhibition," was opened at Olympia on Saturday, May 21st, and will remain open until June 4th. There are few electrical exhibits. Messrs. W. H. Sugden & Co., Ltd., show their "Blick" model C clothes and dish washer, which is electrically heated. It is supplied with a 3-heat switch and a pilot lamp on the switchboard. They also show a new electrically driven model with the same capacity as existing models (14 gallons). Messrs. Beatty Bros. have attached to their wringer a new finger-guard, which is easily released and reversible. The Anti-Waste Appliances Co. shows a new small "Peter Pan" electric cooker, with three-heat control and a maximum loading of 1 kW at low price; this is a bachelor cooker and could supplement a larger one. The Staines Kitchen Equipment Co. shows a new large toaster for restaurants which toasts bread on both sides at once. It has a consumption of 1½ kW. Mr. G. Allen's shop-window fittings include effective display lamps. The Miniature Exhibition Railway Co.'s exhibit consists of model engines, from the Rocket to the modern giants, all run electrically, with electrically interlocking points, of the type used on the Metropolitan Railway.

Wages in the Cable-making Industry

We are informed by the Joint Industrial Council for the Electrical Cable-Making Industry that the April 30th cost of living figure was 43 per cent. above the 1914 level. This figure will not involve any alteration in wages on the third pay day in June.

Change of Address

The Glasgow Corporation Electricity Department has moved its headquarters to its reconstructed offices at 75, Waterloo Street, Glasgow, C.2.

Employment During April

The *Ministry of Labour Gazette* states that during April employment in the engineering industry showed little change and remained very bad. The total number of unemployed increased from 258,890 to 260,033, and the proportion from 25.8 to 25.9 per cent. In the electrical engineering section there was a slight improvement, the number of unemployed declining from 15,382 to 15,154, and the percentage from 16.6 to 16.4. Increases were, however, recorded in the electric cable, wire and lamp manufacturing group, from 15,103 to 15,187 (from 13.9 to 14 per cent.), and in the electrical wiring and contracting industry, from 4,235 to 4,332 (from 18.9 to 19.3 per cent.).

B.T.-H. Refrigerators to be Made at Rugby

At the annual general sales meeting of the International Refrigerator Co., Ltd., it was announced that B.T.-H. electric refrigerators will in future be manufactured at the Rugby works of the British Thomson-Houston Co., Ltd. It is estimated that this new development will eventually provide work for another 600 hands at the Rugby factory. The B.T.-H. works already give employment directly or indirectly to 70 per cent. of the population of Rugby. An additional million kWh of electricity a year will be required for the manufacture of the refrigerators at Rugby.

The Machinery Users' Association

The annual general meeting of the Machinery Users' Association (Inc.) was held yesterday. The report submitted mentioned the activities of the Association with regard to the recent legislation involving the complete recasting of the Rating Law and procedure including securing the exemption of machinery from rating. The volume of the work of the Rating and Valuation Department continues to increase and members are asked to give notice immediately if they are likely to require the Association to watch their interests. Members are also invited to submit any suggestions regarding opportunities and means of extending trade.

A D.O.T. Change of Address

The City office of the Department of Overseas Trade has been moved to the second floor of 9-12, Basinghall Street, E.C.2 (telephone: Metropolitan 4713). The office deals primarily with the dissemination of information relating to shipping and transport matters but commercial information of a general

character may also be obtained there. United Kingdom firms requiring detailed or technical information relating to matters other than shipping and transport are, however, advised to address their inquiries to the head office of the Department at 35, Old Queen Street, Westminster, S.W.1.

An Electrical Exhibition at Formby

An exhibition of domestic electrical goods and demonstrations of apparatus have recently been held at the Formby Council's offices with a view to influencing residents to extend their use of the numerous facilities now available for reducing labour in the home. The exhibition was organised by Mr. T. C. Nuttall, who is the representative of Mr. J. Scott (consulting engineer of Liverpool) and the electrical engineer of Formby Urban District Council.

The Sussex Electrical Contractors' Dinner

The annual dinner of the Sussex Branch of the Electrical Contractors' Association was held at the Old Ship Hotel, Brighton, last Friday, Mr. T. Dickenson presiding. Among those present were the president of the Association, Mr. W. R. Rawlings, and the Mayors and Mayoresses of Brighton and Hove.

For Sale

Leicester Electricity Department offers a quantity of electrical plant for disposal.

(See our advertisement pages to-day.)

Wireless Exports

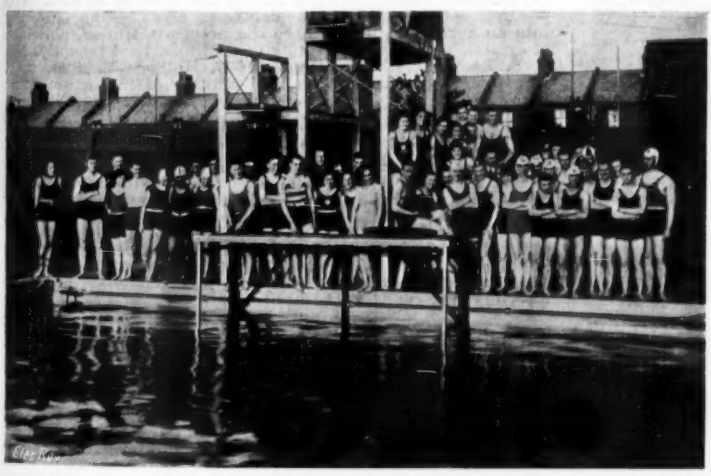
We learn from Messrs. Lissen, Ltd., of Isleworth and Edmonton, that their exports of wireless goods to one market alone have increased by 800 per cent. The total export trade of the British wireless industry during the first three months of this year advanced by £60,000 compared with a year ago, notwithstanding lower prices.

An Electrical Exhibition at Skegness

In connection with the inauguration of the supply of electricity in Lincolnshire by the Mid-Lincolnshire Electric Supply Co., Ltd., an all-electric exhibition is being held this week at the Central Hall, Skegness. Mr. R. Borlase Matthews, the promoter of the Special Order under which the company is operating, was the principal speaker on the opening day.

The Floral Hall, Southport

Messrs. Brookes & Southworth, of Southport, have just completed a contract for the electrical equipment of the new Floral Hall, the latest municipal enterprise. The electrical specification was drawn up by Mr. E. Moxon, the borough electrical engineer. Apart from the numerous decorative lighting points and the modern stage lighting equipment there are numerous power plugs fixed in the café, hall, and pay boxes for operating radiators, vacuum cleaners, and subsidiary plant. The Strand Electric & Engineering Co., Ltd., supplied the stage lighting fittings and stage switchboard, while the General Electric Co., Ltd., provided the lighting fittings in the hall and café, the garden lanterns, and the colour lighting equipment for the dance floor.



Henley's water polo teams

Radio Factory Extensions

Within the past two years the Coventry wireless works of the G.E.C. have had to be considerably extended to cope with the steadily increasing volume of trade. One of the extensions now in progress will give additional floor space of 22,000 sq. ft. This is the second extension made within the past two years to the Coventry No. 3 factory, which is now almost entirely devoted to radio receiver assembly as distinct from the production of component parts, which is concentrated in the adjacent main plant. The completion of this building will increase the capacity of the final assembly sections and also of the testing departments, through which apparatus must pass before reaching the distributing organisations in the Coventry Central Wireless Stores. A previous extension, completed several months ago, consisted of a new block giving additional floor space of 32,000 sq. ft. in these stores, which serve as a distributing centre for the whole of Great Britain.

Social Events

The annual golf match of the Scottish Electrical Manufacturers' and Factors' Association was held at Gleneagles on Tuesday, May 10th. The attendance was large, the weather excellent, and harmony and good fellowship prevailed. The Craigpark Electric Cable Co., Ltd., and British Insulated Cables, Ltd., again supplied the golf balls for use in the game and also as prizes, while the Union Cable Co., Ltd., supplied tees. Other prizes were presented by an honorary member,

Scottish electrical manufacturers and factors at golf

Mr. John MacLure (late of Messrs. Wood and Cairns, Ltd.) and by Mr. Harris (Credenda Conduits Co., Ltd.). During the morning a competition was held with the following result: 1st prize: A. Chalmers (Andrew Chalmers and Mitchell); 2nd prize: J. A. Paterson (Paterson and Service); 3rd prize: Mr. Edwards (Birmingham) (Credenda Conduits Co., Ltd.); 4th prize: Raymond Fawcett (Northern Steel and Hardware Co., Ltd.); 5th prize: Mr. Kilpatrick (Central Electric Co.). After lunch a challenge match between Messrs. Edwards and Paterson versus Messrs. Chalmers and Fawcett was held, the last mentioned gentlemen being the victors by one hole.

The Swimming Section of W. T. Henley's Gravesend's Sports Club held a "splash night" on May 19th and invited the Swimming Club from the city office as visitors. The "splash night" consisted of water polo and water sports of various kinds, followed by a light supper and dance, the function being organised by Mr. W. S. Atkinson (son of Mr. and Mrs. Ll. B. Atkinson) and Mr. Hitchmough. The accompanying illustration shows the water polo teams ready for play.

Recent Contracts

Messrs. D. H. Morris and Co., of Dundee, are to install a new service of electric lighting at Floors Castle for the Duke of Roxburgh. The installation will consist of h.p. cables, h.p. and l.p. switchboards, transformers, motor generators and a stand-by battery set. The contract amounts to over £3,000.

The Curtis Manufacturing Co., Ltd., has obtained a third order for a charging panel for the Great Southern Railways, Ireland, for the Drumm battery installation electric drive for trains. This charging panel is from 250 A to 600 A.

Trade Announcements

The British Electric Transformer Co., Ltd., has appointed Messrs. Adamson & Co. (Tyne), Ltd., Exchange Buildings, Whitehead Street, South Shields, agents for Northumberland, Durham and Tees-side, for "Tricity Sunray" fires and domestic appliances.

The Thames Electric Co., Ltd., St. James' Road, Kingston-on-Thames, announces that its retail and contracting branches have been closed, and that its business will in future be entirely wholesale.

Lockhart and Macnab, electrical contractors, of 34-38, Craigs, Stirling, have opened additional premises at 31, Port Street as a radio department.

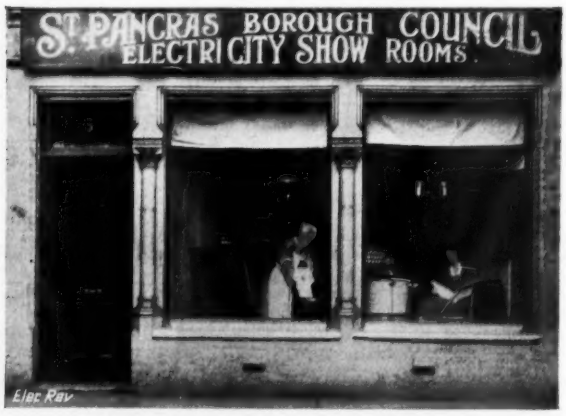
Messrs. Price, Stutfield & Co., Ltd., are removing on June 1st to larger offices at Dominion House, 110, Fenchurch Street, E.C.3.

The Metafiltration Co., Ltd., has purchased the business, patents, works, &c., of Metafilters (1929), Ltd. The services of Mr. J. A. Pickard and the existing technical staff have been retained. The new company will continue the manufacture of filtration plant at the Belgrave Works, Hounslow. An order has just been completed for a transformer oil filter of 300 gallons per hour capacity for the Central Electricity Board.

Messrs. Ilford, Ltd., inform us that supplies of "Imperial" "Illingworth" and "Wellington" X-ray films will not be available after June 30th next. These films are identical with those sold as "Ilford" X-ray films and users may, therefore, in future obtain their films from X-Rays, Ltd. 47, Red Lion Street, W.C.1.

An "Efesca" Window Display

Messrs. Falk, Stadelmann & Co., Ltd., have recently arranged a window display at St. Pancras Borough Council showrooms, in which the old and new methods of carrying out domestic duties are effectively compared. One window shows an old coal fireplace with ashes in the grate, a woman scrubbing clothes in a wash tub, an oil lamp, &c., while the



An "Efesca" display at St. Pancras

other, in which the "Efesca" way has been introduced, shows a woman reading by an up-to-date electrical fitting, surrounded by electrical appliances, including an electric cooker, kettle, fire, vacuum cleaner, washing machine, &c.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, Etc.	Price May 25th.	Fortnight's Inc. or Dec.
a	Acid, Oxalic ... ... per lb.	5½d.	—
a	Ammoniac, Sal ... ... per ton	£60	—
a	Ammonia, Muriate (large crystal) ... ,,	£52	—
a	Borax ... ... ,,	£17	—
a	Copper Sulphate ... ... ,,	£25 10s.	—
a	Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a	,, Perchlorate ... ... ,,	5½d.	—
a	Shellac T.N. ... ... per cwt.	£3 15s.	—
a	Sulphur Commercial ... ... per ton	£11	—
a	,, Roll ... ... ,,	£11	—
a	Soda, Chlorate... ... ... per lb.	3½d. to 3¾d.	—
a	,, Crystals... ... ... per ton	£5 to £5 5s.	—
a	Sodium Bichromate, casks ... ... per lb.	4d.	—
	METALS, Etc		
b	Aluminium, Ingots ... ... per ton	£95 to £100	—
b	,, Wire ... ... per lb.	1/1 to 1/9	—
b	,, Sheet and Foil ... ... ,,	1/1½ to 2/9	—
p	Babbits Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£119	£2 inc.
	Grade II ... ... ,,	£85	—
	Grade III ... ... ,,	£49	£2 dec.
c	Brass (rolled metal 2" to 12" basis)... per lb.	6¼d.	½d. dec.
c	,, Tubes (solid drawn) ... ... ,,	8¾d. to 9d.	½d. dec.
c	,, Wire, basis ... ... ,,	7½d.	½d. dec.
c	Copper Tubes (solid drawn) ... ... ,,	9½d.	½d. dec.
g	,, Bars best selected) ... ... per ton	£61	
g	,, Sheet ... ... ,,	£61	£2 dec.
g	,, Rod ... ... ,,	£61	
g	,, (Electrolytic) Bars ... ... ,,	£36	£1 10s. dec.
d	,, ,, Sheets... ... ,,	£63 10s.	£4 10s. dec.
d	,, ,, Wire Rods ... ,,	£40	£1 10s. dec.
d	,, ,, H.C. Wire ... per lb.	6½d.	½d. dec.
f	Ebonite Rod ... ... ,,	1/3 to 1/6	—
f	,, Sheet ... ... ,,	1/3 to 1/6	—
n	German Silver Wire ... ... ,,	2/2	—
h	Gutta-percha, fine ... ... ,,	nom.	—
h	India-rubber, Para fine ... ... ,,	3¾d.	½d. dec.
i	Iron, Pig (Cleveland No. 3) ... ... per ton	58/6	—
i	,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g	Lead, English pig ... ... ,,	£12 5s.	10s. dec.
g	Mercury ... ... per bot.	£16	—
e	Mica in original cases) small ... per lb.	6d. to 8/6	—
e	,, ,, medium ... ,,	4/- to 8/-	—
e	,, ,, large ... ,,	8/6 to 17/6 & up	—
p	Phosphor Bronze, plain castings ... ,,	1/1¼d.	—
p	,, ,, drawn bars & rods ,,	10½d.	½d. dec.
p	,, ,, rolled strip & sheet ,,	10½d.	½d. dec.
p	,, ,, wire ... ... ,,	11½d.	½d. dec.
o	Platinum ... ... per oz.	£9 15s.	10s. dec.
d	Silicium Bronze Wire... ... ... per lb.	7¾d.	—
r	Steel, magnet, in bars ... ... ,,	7½d.	—
g	Tin, Block (English) ... ... per ton	£124 15s. to £126 15s.	£3 inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Boiling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Vacuum Cleaner Demonstration

At the sales lecture and demonstration of the "Mary Ann" electric vacuum cleaner held at the Memorial Hall, E.C., on Tuesday by British Electric Domestic Appliances, Ltd., Mr. S. Schneider, managing director, said that the event was arranged to assist operations through the trade as against house-to-house canvassing.

The South American Electrical Congress

A report from Buenos Aires states that it has been found necessary to postpone until April, 1933, the first South American Electrical Congress which was to have been held there next July.

Greek Import Restrictions

A ministerial decision has been issued covering the importation of machinery into Greece and fixing the total quantities to be allowed within the period May 15th to November 15th, 1932.

New French Companies

Among new electrical concerns recently formed in France are the Société des Anciens Etablissements Bouyssou-Subra, Paris (80, Rue de Turenne), with a capital of 6,180,000 francs, to acquire and carry on the electric motor manufacturing business of Bouyssou-Subra Co.; the Société de l'Accumulation Hydro-Electrique de la Région Parisienne, Paris (156, Rue de l'Université), and La Société Electrique de Baume-les-Dames, Paris (23, Rue de Rome), to operate in electric power station at Baume-les-Dames.

New Catalogues and Lists

Leda Electric, Ltd., Nelson Street, Miles Platting, Manchester.—An illustrated folder describing the "Leda" electric refrigerator.

Berry's Electric, Ltd., 85-86, Newman Street, Oxford Street, W.1.—A catalogue giving prices and particulars of automatic electric water heaters.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Leaflet No. 847, dealing with low voltage electrode water heaters with automatic load control.

Brook Motors, Ltd., Empress Works, Huddersfield.—A price list (No. 308) of high torque squirrel-cage motors and a leaflet (No. 303) describing hand-operated clutch pulleys.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—A pocket price list of electric motors and control gear.

British Insulated Cables, Ltd., Prescot, Lancs.—A card relating to B.I. enamelled wires.

Bankruptcy Proceedings

C. Brown, wireless and electrical engineer, 36, Leagrave Road, Luton.—The receiving order was made recently, on the debtor's own petition, and the statement of affairs shows liabilities of £1,293, against assets of £592, leaving a deficiency of £701. The position is attributed by the debtor to overstocking, entering into an agreement to purchase the premises, illness, and lack of capital. At the first meeting of creditors, held recently, Mr. P. S. Booth, Kimberley House, 14-17, Holborn Viaduct, E.C., was appointed trustee, with a committee of inspection. The following are the principal creditors.—Baxter & Caunter, Ltd., £41; Edison Swan Electric Co., Ltd., £65; Ensign, Ltd., £93; Falk, Stadelmann & Co., Ltd., £58; Shoolbred Electrical Co., Ltd., £68; and Young & Wildsmith, Ltd., £302.

E. M. Barker and **H. D. Stillwell** (trading as Berks Electrical Company), electrical and wireless engineers, 14, Cross Street, Reading, Berks.—The receiving order was made recently on the debtors' petition, and the statement of affairs filed shows liabilities of £596, against assets of £365, leaving a deficiency of £231. The separate estate of E. M. Barker shows assets of £8 and that of H. D. Stillwell liabilities of £19. The position is attributed to general depression and insufficient net profits to meet drawings and expenses.

A. Johnson, electrical and mechanical engineer, 29, Tichborne Road, West Bowling, Bradford.—Receiving order made May 12th on debtor's own petition. First meeting to-day (May 27th) at the Official Receiver's office, Hallfield Chambers, 71, Manningham Lane, Bradford. Public examination June 21st at the County Court, Manor Row, Bradford.

G. P. Lambourne, wireless dealer, High Street, Westerham.—First meeting to-day (May 27th) at the Official Receiver's office, 8, Old Steine, Brighton. Public examination July 6th at the Town Hall, Tunbridge Wells.

W. H. Sayer, electrical engineer, 14, Rectory Road, Beckenham.—Discharge suspended for one year until March 24th, 1933.

F. Cleasby, jun., electrical engineer, 2, Richmond Terrace, Darwen.—Trustee, Mr. J. W. Carter, Official Receiver, District Bank Chambers, Blackburn, released May 17th.

G. E. Hughes, electrical engineer, 90, Gibbet Street, Halifax.—Receiving order made May 13th on debtor's own petition.

A. C. Clewley (trading as Radioland), electrical goods factor, 21, Portland Street, Walsall.—Receiving order made May 12th on debtor's own petition.

H. W. Lanaford (trading as A. Pritchard & Co.), electrical and automobile engineer, Edford, Eggington Road, Wollaston.—First meeting held May 26th. Public examination, June 8th, at the Court House, Hagley Road, Stourbridge.

A. Whitelock, wireless dealer, Tholthorpe.—First meeting held May 26th. Public examination, June 9th, at the Law Courts, Clifford Street, York.

A. De Villiers (trading as the Castle Radio Manufacturing Co.), wireless and electrical manufacturer and dealer, 151, Westminster Bridge Road, S.E.—Trustee, Mr. F. T. Smith, 150, Southampton Row, W.C.1, appointed May 11th.

S. Gillitt (trading as G.E.T. Electrical Supplies Co.), electrical goods dealer, Lansdowne, Offerton Lane, Offerton, near Stockport.—First and final dividend of 1s. 3½d. in the £, payable May 27th at the Official Receiver's offices, Byrom Street, Manchester.

T. H. C. Hughes, electrical and wireless engineer, 1,090, Man-

chester Road, Bradford.—The public examination was held recently at the County Court, Bradford. The statement of affairs showed gross liabilities of £375, assets of £174. The position was attributed to general depression in trade and keen competition. The examination was closed.

H. E. Sandell, electrical engineer, 1, Sandpit Lane, St. Albans.—Trustee, Mr. J. L. Poland, 29, Russell Square, W.C.1, released May 18th.

Company Liquidations

Halcyon Wireless Co., Ltd., Pembridge Villas, Notting Hill Gate, W., also at Birmingham and Leeds.—The report of the Official Receiver (who is also acting as liquidator) has been issued together with a summary of the statement of affairs, which shows gross liabilities of £20,219 (ranking £17,669), assets of £2,530, absorbed in the preferential (£190) and debenture (£3,000) claims, and a total deficiency of £21,119 with regard to contributories, the issued capital consisting of 4,450 ordinary shares of £1 each. Endeavours have been made to dispose of the business as a going concern, but the receiver states that he does not anticipate that the assets will realise sufficient to discharge the claims of the debenture holder in full, and in such circumstances there would appear to be no possibility of any dividend being paid to the unsecured creditors in the liquidation. The failure of the company is attributed by the directors to insufficient capital with which to meet the heavy overhead expenditure during the time the company was overcoming the difficulties experienced in perfecting the designs for placing on the market a commercially satisfactory receiver. In the opinion of the Official Receiver the failure is primarily attributable to the very heavy losses made in trading during the last two and a half years in which the company carried on its business. While some attempt appears to have been made by the directors to curtail the overhead expenses during this period the economies effected were by no means commensurate with the serious financial position of the company.

L. Kremner, Ltd., wholesale wireless factors, 78, King Street, Manchester.—A meeting of creditors was held on May 18th at the Midland Hotel, Manchester, when a statement of affairs showed liabilities of £28,931 and assets of £16,328. After allowing preferential claims of £563, the net assets were £15,764, or a deficiency with regard to creditors of £13,167. The issued capital of the company amounted to £5,000, making a deficiency with regard to contributories of £18,167. The position of the company was attributed to the economic and fiscal changes which came about as the result of the crisis last September. The company had booked orders in foreign currency and the manufacturers would not supply at the old rates. The company decided to manufacture, and the works were then started. Difficulties had also been experienced in obtaining certain supplies. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Latham and Mr. Shepherd as joint liquidators, together with a committee consisting of the representatives of Messrs. Corfield & Cripwell; the Chorlton Metal Co., Ltd.; Hardman & Co.; Kolster Brandes, Ltd.; and Tekade.

Kinetic Wireless & Electric Supplies, Ltd.—Winding up voluntarily. Liquidator, Mr. S. P. Child, 36 and 37, Queen Street, E.C.4.

Dean & Gosling, Ltd.—Particulars of claims to the liquidator, Mr. L. J. Cozens, 8, East Stockwell Street, Colchester, by June 30th.

Private Arrangements

J. K. Gardner (trading as Gardner Brothers), wireless and electrical dealer, 12, High Street, Cinderford, and 52, Bell Street, Henley-on-Thames.—The creditors were called together on May 18th at Winchester House, E.C. The statement presented showed liabilities of £1,115, and assets of £430, with a deficiency of £685. An offer was made of a composition of 6s. in the £, payable as to 2s. forthwith, 2s. in six months, and 2s. in twelve months. A resolution was passed accepting the offer, and it was resolved that a deed of composition should be executed in favour of Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., as trustee, with a committee of inspection. The following are the principal creditors:—Callender's Cable & Construction Co., Ltd., £89; Chloride Electrical Storage Co., Ltd.; £54; Dulcetto Polyphone Co., Ltd., £55; Edison Swan Electric Co., Ltd., £137; Ever-Ready Co. (Great Britain), Ltd., £75; General Electric Co., Ltd., £139; and Young & Wildsmith, Ltd., £81.

T. H. Kenyon, electrical and wireless engineer, Eshton Terrace, and 3, Woone Lane, Clitheroe.—At the recent meeting of creditors a statement of affairs submitted showed liabilities of £2,553, of which £2,174 was due to unsecured creditors and £379 was in respect of a partly secured creditor. The total claim of the latter was £419, but securities to the value of £40 were held. The assets totalled £1,450, and after allowing £19 for preferential claims, the net assets were £1,431, leaving a deficiency of £1,122. No offer was submitted, and it was decided that a deed of assignment should be executed to Mr. A. B. Britcliffe, of Accrington. A committee of inspection was also appointed. The following are the principal creditors: Palmer Riley & Co., Ltd., £120; T. Beadley & Co., £90; J. G. Coats, Ltd., £70; Hardman Bros., £69; Globe & Simpson, Ltd., £62; Philco, Ltd., £55; Lee & Swindles, £50.

Meeting of Creditors

Central Electrical Co. (Nottingham), Ltd.—A meeting of creditors was held at the office of Messrs. Kenneth Craig & Partners, Swinton House, 324, Gray's Inn Road, W.C.2, on Wednesday last.

Winding-up Petitions

Home Electric, Ltd.—A petition for the winding up of this company was presented at the High Court on May 17th by the Brook Radio Co., Ltd., and will be heard in London on May 30th.

Davey, Paxman & Co., Ltd.—A petition for the winding up of this company was presented to the High Court on May 13th by Messrs. Hathorn, Davey & Co., Ltd., and will be heard in London on May 30th.

Lowdens Valves, Ltd.—A petition for the winding up of this company was presented at the High Court on May 17th by the Kelvin Construction Co., Ltd., and will be held in London on May 30th.

Electricity Supply

Lighting, Domestic, Power

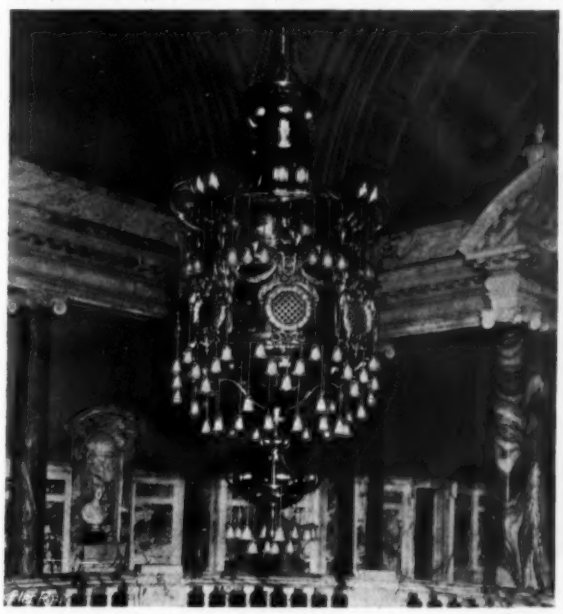
Accrington.—YEAR'S WORKING.—There was a net profit of £7,000 on the operation of the Corporation Electricity Department during the year ended March 31st, while there was an increase of 1,000,000 kWh in the sales of electricity.

CHEAPER ELECTRICITY.—The lighting flat rate is to be reduced from 5d. to 4½d. per kWh.

Annfield Plain.—YEAR'S WORKING.—A profit of £264 is reported on the Urban District Council's electricity undertaking for the past year.

Australia.—ELECTRICITY COMMISSION.—The Cabinet of Victoria has decided to abolish the position of fourth member of the State Electricity Commission, which had been vacant since the death of Sir John Monash. As originally constituted the Commission consisted of three members, which number was later increased to four. The present members are Mr. F. W. Clements (chairman), Sir Robert Gibson, and Sir Thomas Lyle.

THE YALLOURN EXTENSIONS.—An announcement made by the Victoria Electricity Commission states that the first of the three



A 100-light electrolier, weighing three tons, which has recently been rewired at the City Hall, Belfast, by Messrs. William Coates & Son, Ltd. Henley cab tyre sheathed cables and flexibles were used

25,000-kW turbo-alternators which it is proposed to install in the extended Yallourn power station is almost ready to be put into regular service.

Aylesbury.—SUPPLY TO KINGSTON BLOUNT.—The Town Council has decided to ascertain if the Wessex Electricity Co. will consent to the Corporation giving a supply of electricity to Kingston Blount, which is in the company's area.

Bedford.—EXTENSIONS.—The Electricity Committee proposes to apply for sanction to a loan of £4,992 for the purpose of extending the supply to Broom, and Stanford and Wilstead.

Bethesda (Caernarvon).—CHEAPER ELECTRICITY.—The lighting charge is to be reduced from 7d. to 5d. per kWh. Reductions are also to be made in the minimum charges from 11s. 3d. to 6s. 3d. for the winter quarters, and from 7s. 6d. to 4s. 2d. for the summer quarters. The privileges granted to large-scale consumers some time ago are to be withdrawn.

Bexhill-on-Sea.—SUB-STATIONS.—The Electricity Committee has approved plans for three new sub-stations.

Blackburn.—YEAR'S WORKING.—The annual report of Mr. W. A. Royle, engineer and manager of the Electricity Department, is of such a satisfactory character that it is expected that the Committee will be able to remove the 10 per cent. post-war addition to consumers. A debit of £14,048 on 1931 has been converted into a net credit balance of £1,093. Electricity sold increased during the year from 24,481,070 to 26,484,089 kWh, the principal advance being in energy supplied for power (10,527,383 to 11,883,464 kWh). The maximum load was recorded on December 21st, 1931 (12,800 kW), and additional consumers connected during the year (including 532 on assisted wiring) were 1,441, the present consumers numbering 15,139.

Bolton.—PLANT IMPROVEMENTS.—Additional plant for the purpose of cooling and screening the circulating water used

for condensing purposes at the Back-o-th'-Bank generating station is to be provided similar to that previously installed.

Brighton.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains to the Whitehawk Estate at a cost of £5,110.

LOAN SANCTIONED.—Sanction has been received to the borrowing of £10,686 for mains and services and £1,500 for works in connection with the change of system and changing consumers' apparatus.

A BRIGHTER AQUARIUM.—The Aquarium Committee is to improve the electric lighting at the Aquarium at a cost of £400.

SUPPLY TO HANGLETON AND WEST BLATCHINGTON.—The Electricity Committee has obtained consent of the Hove Corporation to supply electricity in the parishes of Hangleton and West Blatchington in the borough of Hove.

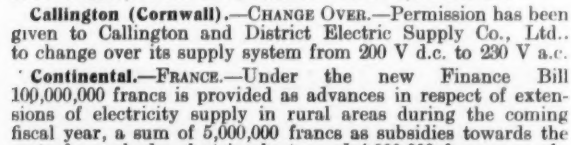
NEW PLANT.—It is proposed to provide new plant at the Castle Square sub-station at an estimated cost of £3,110.

EXTENSION OF POWER STATION.—Arrangements have been made with the Central Electricity Board for the extension of the Southwick power station. Tenders are to be invited for new plant, and the Committee is to apply for sanction to a loan of £300,000 for the installation of a 30,000-kW set.

Callington (Cornwall).—CHANGE OVER.—Permission has been given to Callington and District Electric Supply Co., Ltd., to change over its supply system from 200 V d.c. to 230 V a.c.

Continental.—FRANCE.—Under the new Finance Bill 100,000,000 francs is provided as advances in respect of extensions of electricity supply in rural areas during the coming fiscal year, a sum of 5,000,000 francs as subsidies towards the cost of new hydro-electric plants, and 4,000,000 francs as subsidies in respect of new power transmission lines.

According to *L'Electricien* the output of the fifty principal



The Archibald Memorial at Sydney illuminated by G.E.C. floodlights in connection with the opening of the Harbour Bridge

electric power stations in France which produce about 62 per cent. of the total French output, amounted during February last to 712,000,344 kWh, bringing up the aggregate for the first two months of the year to 1,486,528,080 kWh, as compared with 1,650,373,495 kWh in the corresponding period of 1931.

HOLLAND.—The first 150,000-V power transmission line in Holland has just been completed between the steam-operated power station at Geertruidenberg, and Eindhoven, a distance of about 33 miles. The line is in duplicate and has a capacity of 140,000 kVA. The equipment at the sub-stations was supplied by the Ateliers de Constructions Electrique de Delle, of Lyons, France.

RUSSIA.—This is the first year of the Second Five Year Plan, and extensive electrical developments have been planned. The output of electricity is to be increased from the estimated 17 milliard kWh at the end of this year to 100 milliard kWh in 1937.

Cranbrook.—SUPPLY AGREEMENT.—The Rural District Council has entered into an agreement with the Weald Electricity Supply Co., Ltd., for the supply of electricity to Council houses at Cranbrook wired on the hire-purchase system.

Croydon.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £1,793.

AUTUMN EXHIBITION.—It is proposed to hold an electrical exhibition to stimulate interest in the use of electricity in the home for a fortnight during September or October.

Fifeshire.—SUPPLY EXTENSION.—Permission has been granted to the Fife Electric Power Co. to lay cables to Orkie Farm, Freuchie, and to Auchtermuchty.

Grimsby.—EXTENSIONS.—The Electricity Committee has decided to provide a supply to Barnoldby-le-Beck at a cost of £2,815.

Hastings.—LOANS.—The Electricity Committee has recommended that loans of £11,340 for mains and £6,085 for sub-station buildings and equipment be applied for.

Heckmondwike.—ASSISTED WIRING SCHEME.—The Urban District Council has adopted an assisted wiring scheme which enables consumers to have four lighting points (or three lighting points and one heating point) with an extra charge of 1d. per kWh up to 1,050 kWh, or five lighting points (or four lighting points and one domestic plug) with an extra 1d. per kWh up to 1,300 kWh.

Irish Free State.—ELECTRICITY PRODUCTION CENSUS.—A census of production of electricity undertakings in the Free State has just been issued by the Department of Industry and Commerce for the year 1929. Most of the undertakings covered by the return have been absorbed into the Shannon Scheme. The total electricity generated in 1929 was 90,072,278 kWh, of which 5½ million kWh was sold in bulk by generating concerns to others for distribution, as against 65,403,316 kWh in 1926.

Isle of Man.—DOUGLAS.—The Tynwald is being asked to sanction the expenditure of £50,000 for electrical developments in the island. As a first step, Douglas Corporation proposes to purchase a 300-kW alternator and h.p. and l.p. switchgear, to meet the increased demand during August.

Kettering.—EXTENSIONS.—The Electricity Committee has obtained sanction to a loan of £3,000 for sub-stations and equipment, and permission to erect overhead lines in the parishes of Middleton, Cottingham, and Clipston.

Kilmarnock.—SALE OF UNDERTAKING.—The Town Council has decided to oppose the sale of the Ayrshire electricity undertaking. Negotiations for the sale have been proceeding between the Ayrshire Electricity Board and the Power Securities Corporation, Ltd., through Mr. Balfour of Messrs. Balfour, Beatty & Co., Ltd.

Lochaber.—HYDRO-ELECTRIC SCHEME.—On May 21st Mr. Balfour, of Messrs. Balfour, Beatty & Co., the contractors for the Lochaber hydro-electric scheme, electrically fired the shot which blew out the rock and linked up two sections of the tunnel being driven through a mountain spur for the diversion of the waters of Loch Laggan into Loch Treig.

London.—BATTERSEA.—In order to deal with the increasing load in the southern area, the Electricity Committee proposes to lay an h.p. sub-feeder from Chatham House to the neighbourhood of Belle Vue Road. The estimated cost, with the provision of a kiosk with the necessary transformer and switchgear, is £6,777. It is also proposed to carry out work as follows: (i) Electricity services to 233 premises, £2,208; (ii) alterations to sub-station switchgear at the premises of the Projectile Engineering Co., £107; (iii) replacement with modern cable of old vulcanised bitumen distributors, £119. Sanction is to be applied for loans of £3,955 for machinery for the electricity undertaking, and of £38,000 for the purchase of a site in Lombard Road for future development.

STOKE NEWINGTON.—The Electricity Committee has obtained sanction to a loan of £2,000 for cookers to be supplied on hire.

Louth.—CABLE EXTENSIONS.—The Electricity Committee is to extend a cable to Elkington Road at a cost of £396.

Machynlleth.—LOCAL SUPPLY SCHEME.—A local company has been formed for the purpose of providing a supply of electricity for the town by means of a hydro-power scheme. The North Wales Power Co. has informed the promoters that it has no objection, and therefore a Special Order is to be sought. The engineer is Mr. Harris, and the estimated cost of the scheme, which provides for 110 h.p., is £7,500.

Mexborough.—SALE OF UNDERTAKING.—The sale of the municipal supply undertaking for £60,000 has been postponed.

Morecambe.—PUBLIC LIGHTING IMPROVEMENTS.—The Corporation Entertainments and Foreshore Committee has considered schemes of illuminations for Happy Mount Park and the Promenade from the Tower to the Battery, and has approved a scheme involving an expenditure of £2,400.

Northern Ireland.—BELFAST.—The Tramways Committee has recommended that application be made to the Minister of Home Affairs for sanction to a loan of £37,196 for renewing and altering the tramway feeder cables, and the purchase of a rotary converting plant.

Penrith.—SPECIAL ORDER.—The Electrical Distribution of Yorkshire, Ltd., who recently purchased most of the share capital of the Penrith Electric Supply Co., has approached the Urban District Council suggesting the inclusion of the town within the area of the Mid-Cumberland Electricity Co., an associated concern, by means of a Special Order, under which the Council would abandon its privilege to purchase the undertaking. A special committee has been appointed to consider the matter with a technical adviser.

Plymouth.—YEAR'S WORKING.—The accounts of the Electricity Department of the past year show a net profit of £5,206.

CABLE EXTENSIONS.—The Electricity Committee has authorised cable extensions in eleven streets of the city costing over £700.

Reigate.—EXTENSION OF SUPPLY AREA.—An Order has been granted to the London and Home Counties Electricity Board authorising the extension of the area of supply to include the parishes of Betchworth, Buckland, Gatton, Kingswood, Leigh, and Walton-on-the-Hill.

Settle.—OVERHEAD LINE.—The Settle Electricity Co. is applying for consent to erect an overhead line from Nelson with a view to taking a supply from that town.

South Africa.—ELECTRICITY IN MINING.—Last year the mining industry spent £597,843 on electrical equipment, of which the biggest items were £184,600 for power lines and transformers, &c., and £156,891 for hoists.

CAPE TOWN.—The ratepayers have approved a proposal of the City Council to spend £500,000 on electricity extensions.

South America.—URUGUAY.—*Reuter's Trade Service* learns from Montevideo that the Minister of Public Works is considering plans for a hydro-electric power station on the Rio Negro. According to the state engineer, it is considered possible to utilise the electricity generated by this river for the production of hydrogen by electrolysis. The Minister has nominated a committee of local engineers to consider the scheme.

Southend-on-Sea.—BULK SUPPLY SCHEMES.—The Town Council has submitted terms to the War Department for a supply of electricity in bulk to the Government premises at Shoeburyness. A loan of £2,037 for plant for transformer stations at the new General Hospital and the factory of E. K. Cole, Ltd., has been applied for. A bulk supply is to be given to Shoeburyness Urban District Council under a fifteen years' agreement on the following terms: The Corporation is to lay a 11,000-V main from Thorpe Bay to Shoeburyness, to install the necessary switchgear and transformers in a station provided by the Urban District Council, and to convert the supply to 3,000 V. The standing charge, under the agreement, is to be £3 15s. per kW of maximum demand, plus 0.3d. per kWh consumed.

South West Wales.—SPECIAL ORDER.—Application has been made by the West Cambrian Power Co., Ltd., to consolidate, alter, and amend the Cardiganshire, Carmarthenshire, and Pembrokeshire draft Special Orders for which application was made by the West of England Electricity, Ltd., by the consolidation of the three Orders under the title of the South West Wales Electricity Special Order. Provision is also made in the application for the transfer to the West Cambrian Co. at any time of the Llandilo and Tenby undertakings, and for the revocation of the Haverfordwest Special Order.

Swansea.—LOANS.—The Electricity Committee is applying for sanction to loans of £220,000 for meters and services, and £6,000 for domestic apparatus.

Uphall.—SUPPLY IMPROVEMENTS.—To improve the supply in the Uphall area the Scottish Central Electric Power Co. is to provide a new interconnector at a cost of £5,000.

Walderslade (Kent).—EXTENSIONS.—The extension of supply to the village is now being considered by the Kent Electric Power Co.

Walton-le-Dale.—ELECTRICITY FOR COUNCIL OFFICES.—Electricity is to be installed at the Council offices at Bamber Bridge.

Warrington.—OVERHEAD LINES.—The Electricity Committee has decided to apply for sanction to a loan of £1,670 for the erection of overhead lines.

Wellingborough. — MAINS EXTENSIONS. — The Wellingborough Electric Supply Co., Ltd., proposes to lay underground cables in Westfield Road, St. Barnabas Street, Oxford Street, High Street, Silver Street, Sheep Street, Market Street, Market Square, and Midland Road.

Wellington (Somerset).—PUBLIC LIGHTING.—The Urban District Council has accepted a tender by the Wellington District Electricity Co., Ltd., for street lighting for a period of five years.

Traction

Continental.—RUSSIA.—During the next five years, in accordance with the Second Five Year Plan, 30,000 km. of new railway line is to be constructed and an equal length of existing line is to be electrified.

Croydon.—TRACK RENEWAL.—The Corporation is to reconstruct the tram track in High Street and South End at a cost of £8,695.

Japan.—RAILWAY ELECTRIFICATION.—The I.G.R. proposes to electrify the Maibara-Tsuruga section of its system at a cost of 7,000,000 yen, of which 3,500,000 yen is for electrical equipment.

Lancashire.—TRAMS TO GO.—The Corporations of Heywood, Rochdale, and Bury have decided to substitute buses for trams in their districts.

London.—GREENWICH.—The first section of the new plant has been installed at Greenwich tramway power station.

L.N.E. Railway.—AUTOMATIC TRAIN LIGHTS.—Experiments are being carried out on the London and North Eastern Railway Company's suburban lines with a view to utilising a selenium cell for switching on the train lights automatically in tunnels and when passing under bridges.

Siam.—THE ROYAL STATE RAILWAYS.—The use of the Diesel-electric service, which was put into operation at the end of last year, has brought about a considerable acceleration in services as well as reduced running costs. The journey between Bangkok and Penang now takes 26½ hours instead of 31½ hours.

South Shields.—TRAMWAY EXTENSION.—A £7,000 scheme for the extension of the Town Council's tramway system has been approved by the Tramways Committee. It is understood that the system will be extended to the Cleadon Park housing estate and will afford cheaper transit than the existing omnibus service.

Sunderland.—TRACK RENEWAL.—The Town Council has commenced work on the renewal of the tram track in High Street, West Sunderland.

Traffic Signals.—NEW INSTALLATIONS.—It is proposed to install automatic traffic signals at Dunchurch, near Rugby; at the corner of Edgar and Eign Streets, Hereford; Stirling; Cundy Cross and Townend, Barnsley; Tynemouth; Croydon; Staines and various parts of Middlesex.

Communications

Bulgaria.—TELEPHONY.—The telephone system is a State monopoly, under the direction of the Ministry of Railways, Posts, and Telegraphs. There are only 18,075 telephones in the country, of which Sofia has 7,500, Plovdiv 800, Rousse (Rustchouk) 600, Varna 600, and Bourgas 400. Besides the urban telephone lines there are about 11,250 miles of long-distance telephone lines in Bulgaria.

Canada.—BROADCASTING BILL.—The Bill to establish a Broadcasting Commission has been read a first time in the Canadian House of Commons.

Great Britain.—RADIO EXCHANGES.—New Forest Rural Council has decided to raise no objection to the establishment of a wireless relay service for the district.

Teddington Town Council has refused an application by the Central Electric Co.

Hemel Hempstead Town Council is considering an application by Broadcast Listeners' Service, Ltd.

Northfleet U.D.C. Works Committee has told Gravesend Radio Central Exchange, Ltd., that it recommends the Council not to agree to the erection of poles on the public highways. The question of the erection of poles on Council property and the wiring of houses has been deferred.

Hull.—TRAWLERS' WIRELESS TELEPHONES.—Trawlers at Hull and Grimsby are being fitted with wireless telephone equipment, no fewer than 45 Marconi installations having been completed for various owners within the last few weeks. The Regulations permit these equipments to be operated by the skippers, so that no expense is involved in carrying special operators. Three wireless telephony shore stations already exist on the British coasts with which trawlers can exchange messages, and in the near future a chain of eleven shore stations will circle the British Isles. The Marconi equipment is sufficiently flexible to allow broadcasting stations to be tuned in without the necessity of separate receivers being carried.

India.—BROADCASTING.—Ten thousand radio sets are now in use, an average of one per 30,000 persons, almost all of them being in the Presidency towns of Bombay, Madras, and Calcutta. Mr. Sethna, Station Director of the Indian State Broadcasting Service, says that a high-power station is needed at the centre, with other short-wave transmitting stations in one or two places so that people can listen to all sorts of programmes on crystal sets. At present there were many obstacles which had to be surmounted, but he was confident that the negotiations which were now in progress between the Indian State Broadcasting Service and the British Broadcasting Corporation would be carried to a successful issue.—*Reuter* (Bombay).

Rhodesia.—BEAM RADIO.—Imperial and International Communications, Ltd., announces that last Monday a new beam wireless telegraph service was opened between this country and Northern and Southern Rhodesia and Nyassaland. The service communicates with the beam wireless station erected by the company at Salisbury, Rhodesia, and the routing instruction for telegrams from the United Kingdom is "*via* Marconi."

Switzerland.—WORLD BROADCASTING STATISTICS.—According to the International Broadcasting Bureau, Geneva, there are believed to be no fewer than thirty-four million broadcast radio receivers in use throughout the world. The Bureau's estimate of four listeners per set indicates that 136 million people make use of broadcasting. The number of sets used in the U.S.A. is estimated at between twelve and fourteen millions. In Great Britain the number of licences issued is 4,686,000, or 100 per 1,000 of the population.

The motor generator room at the new Scottish regional broadcasting station (see page 778)

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Arbroath.—June 8th. Town Council. Electrical work at fifteen blocks each of four three-apartment houses. Messrs. Carver & Symon, 11, Brothock Bridge, Arbroath (deposit £1 1s.).

Abergele.—June 13th. Abergele and Pensarn Urban District Council. Electrically driven pumping plant. Mr. R. Green, 37, Bennett's Hill, Birmingham (deposit £3 3s.).

Cleethorpes.—June 10th. Urban District Council. Switchgear, transformer, l.p. cables, &c. (See this issue.)

Cheadle and Gatley.—June 7th. Electricity Department. Transformers, switchgear and cable. (May 20th.)

Dumfries.—June 11th. County Council. Electric lighting and heating work at new academy at Moffat. County clerk.

East Ham.—June 14th. Education Committee. Installation of electric lighting at Shaftesbury and Storey Street Schools. (May 20th.)

Eccles.—May 30th. Electricity Committee. Three 250-kVA, 3-phase, oil-cooled transformers; three 500-kVA sheet-steel transformer kiosks, with e.h.p. and l.p. switchgear equipment; single-phase a.c. house service meters. Borough electrical engineer, Electricity Offices, 1, King Street.

Egypt.—CAIRO.—June 15th. Ministry of Public Works. Electrically driven fuel oil pumping set. (G.X. 11490.)*

Farnworth.—June 3rd. Electricity Department. L.p. cables and disconnecting boxes. (May 20th.)

Galloway.—May 31st. Galloway Water Power Co. Construction of Tongland Dam. Sir Alexander Gibb & Partners, Queen Anne's Lodge, Westminster, S.W.1 (deposit £10 10s.).

High Wycombe.—June 23rd. Corporation. Electrically driven pumping plant for Pann Mill Waterworks. Mr. W. Vaux Graham, 5, Queen Anne's Gate, S.W.1 (deposit £5).

Lanark.—May 31st. County Council. Various works, including electric lighting, at 108 houses. Mr. P. C. Smith, county housing and town planning engineer, 13, Clydesdale Street, Hamilton.

Liverpool.—Mr. P. J. Robinson, city electrical engineer, informs us that the Corporation Electricity Supply Department is not in the market for 12-kVA transformers as stated in our issue of May 13th.

London.—CENTRAL ELECTRICITY BOARD.—June 6th. 33-kV switchgear for the South West England and South Wales Scheme. (May 13th.)

OFFICE OF WORKS.—June 3rd. Electrical accessories. (See this issue.)

Longtown (CUMBERLAND).—Electrical installation at the Arthuret Parish War Memorial Hall. Secretary, Memorial Hall, Longtown.

Manchester.—June 6th. Electricity Committee. Automatic telephone equipment at the Dickinson Street Offices and Polygon Depôt. (May 13th.)

New Zealand.—WELLINGTON.—July 27th. Post and Telegraph Department. Battery plates. (A.X. 11355.)*

Penicuik.—May 31st. Town Council. Electric lighting at housing scheme. Messrs. Morham & Brotchie, surveyors, 29, Hanover Street, Edinburgh.

Portland.—June 1st. Urban District Council. Underground mains, distributors, sub-station equipment and transformers. (May 20th.)

Sheffield.—June 6th. Corporation Tramways and Motors. Traction lamps, cables, armature coils, commutators, &c. Mr. A. R. Fearnley, general manager, Division Street.

South Africa.—CAPETOWN.—July 7th. City Council. L.p. metal-clad switchgear. (A.X. 11354.)*

West Riding.—June 13th. County Council. Installation of electric lighting at the Maltby infant school and the Whitwood Mere senior school. Education officer, County Hall, Wakefield.

Whimple (EXETER).—June 1st. Parochial Church Council. Electric heating installation at Parish Church. Honorary secretary to the Council.

---

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barnard Castle.—Rural District Council. Accepted. Electric lighting of the Council houses at Cockfield.—Grey Bros.

Boxhill.—Electricity Committee. Recommended. Meters.—Edison Swan Electric Co., Ltd.; Chamberlain & Hookham, Ltd.

Bradford.—City Council. Accepted. Transformer chamber (£5,000).—English Electric Co., Ltd.

Croydon.—Electricity Committee. Recommended. Reactor for Elis David road feeder (£274).—Crompton Parkinson, Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during April :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Electric battery gear.—D.P. Battery Co., Ltd.
Junction boxes.—L. Weekes (Luton), Ltd.
Electric cables.—Anchor Cable Co., Ltd.
One-ton electric winch.—Napier Bros., Ltd.
Electric lamps.—General Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.
Switches.—Alfred Graham & Co., Ltd.
Tuner amplifiers, tuners, range coils, and note magnifiers.—H. W. Sullivan, Ltd.; Radio Instruments, Ltd.; Plessey Co., Ltd.
Wireless valves.—General Electric Co., Ltd.
Electric welding plant.—Quasi-Arc Co., Ltd.

WAR OFFICE.
Electric cable.—General Electric Co., Ltd.
Generators.—Small Electric Motors, Ltd.
Electric lamps.—British Thomson-Houston Co., Ltd.; Stella Lamp Co., Ltd.; General Electric Co., Ltd.; Cryselco, Ltd.

AIR MINISTRY.
Accumulators.—Peto & Radford, Ltd.
Generators.—Rotax, Ltd.; Small Electric Motors, Ltd.
Filament lamps.—General Electric Co., Ltd.
W/t. valves.—General Electric Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
Cable.—W. T. Henley's Telegraph Works Co., Ltd.; Standard Telephones & Cables, Ltd.
Conduit.—Key Engineering Co., Ltd.
Switchgear.—Electric Control, Ltd.
Train lighting spares.—J. Stone & Co., Ltd.
Wireless valves.—General Electric Co., Ltd.

POST OFFICE.
Protective apparatus.—Phœnix Telephone & Electric Works, Ltd.
Telegraphic apparatus.—Hall Telephone Accessories (1928), Ltd.
Telephonic apparatus.—Automatic Electric Co., Ltd.; Edison Swan Electric Co., Ltd.; Ericsson Telephones, Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Telephone Manufacturing Co. (1929), Ltd.
Batteries.—D.P. Battery Co., Ltd.
Coin collecting boxes.—Hall Telephone Accessories (1928), Ltd.
Cable.—Hackbridge Cable Co., Ltd.; St. Helens Cable & Rubber Co., Ltd.
Cleaning and repairing clocks and dials for service boxes.—Venner Time Switches, Ltd.
Loading coils.—Standard Telephones & Cables, Ltd.
Telephone cords.—Phœnix Telephone & Electric Works, Ltd.
Detectors.—Ernest Turner.
Dynamotors.—Walter Jones & Co.
Electric light fittings.—Revo Electric Co., Ltd.; Sigma Electrical Manufacturing Co., Ltd.
Meggers.—Evershed & Vignoles, Ltd.
Rectifiers.—Westinghouse Brake & Saxby Signal Co., Ltd.
Thermionic valves.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.
Copper wire.—Pirelli-General Cable Works, Ltd.; Richard Johnson & Nephew, Ltd.
Replating batteries.—Liverpool Central, North and Bank Telephone Exchanges : Tudor Accumulator Co., Ltd.
Cabling, loading coils and terminations.—Standard Telephones & Cables, Ltd.
Electric lighting.—Blackpool Head Post Office and Telephone Exchange : Alex. Hawkins & Sons; Kensington Telephone Exchange : Electrical Installations, Ltd.
Telephone exchange equipment.—Cullingworth (Keighley automatic area) : General Electric Co., Ltd.; Monument (London automatic area); Bristol Central; Portsmouth; Hayling Island (Portsmouth automatic area) : Automatic Electric Co., Ltd. Bedford : Standard Telephones & Cables, Ltd.
Telephonic repeater equipment and power plant.—Preston (Lancs); Carlisle : Standard Telephones & Cables, Ltd. Subcontractors for Preston and Carlisle : D.P. Battery Co., Ltd., for batteries; Electric Construction Co., Ltd., for motor generators.

London.—BERMONDSEY.—Health Committee. Recommended. Refrigerator (£99).—British Thomson-Houston Co., Ltd.

HAMMERSMITH.—Electricity Committee. Recommended. Conversion of feeder and machine switches from 150,000 kVA to 250,000 kVA rupturing capacity.—Ferguson, Pailin, Ltd. (£1,751); General Electric Co., Ltd. (£475).

STEPNEY.—Electricity Supply Committee. Recommended. Steel conduits, fittings, switches, &c., for 12 months for the Wiring Department (£544).—W. White & Co. Two 300-kVA transformers (£226).—Hackbridge Electric Construction Co., Ltd.

BATTERSEA.—Electricity Committee. Recommended. Switchgear for sub-station at Carlo Gatti's premises (£144).—Switchgear & Cowans, Ltd.

FULHAM.—Electricity Committee. Generating plant, comprising two 60,000-kW turbo-alternators, with exciters, feed water heaters, &c.—Brush Electrical Engineering Co., Ltd. (£160,944); A.E.G. (£198,810); Siemens-Schuckert (Great Britain), Ltd. (£254,527); General Electric Co., Ltd. (£258,432); Metropolitan-Vickers Electrical Co., Ltd. (A.) (£259,390); Metropolitan-Vickers Electrical Co., Ltd. (B.) Recommended (£261,426); Richardsons, Westgarth & Co., Ltd. (£267,700); British Thomson-Houston Co., Ltd. (£269,012); English Electric Co., Ltd. (£269,117). C. A. Parsons & Co., Ltd. (£275,738).

Steam-raising plant, comprising six water-tube boilers, stokers, superheaters, air heaters, &c. :—

	Make of Stoker. Erith Roe.	Riley.	Taylor.
	£	£	£
Stirling Boiler Co., Ltd. (Rec.) ...	**319,036**	320,028	331,057
Babcock & Wilcox, Ltd.	329,385	330,413	341,357
International Combustion, Ltd....	386,748	374,105	373,342
Simon-Carves, Ltd.	383,859	365,088	371,116
Clarke, Chapman & Co., Ltd. ...	404,690	401,991	410,727
John Thompson Water Tube Boilers, Ltd.	409,685	408,258	415,316

The quotation of the Underfeed Stoker Co., Ltd., was £314,360. The Committee has made alterations which make the quotation £368,898 so that three of the six boilers shall be equipped

with Erith Roe stokers and three with Taylor stokers, so that experience may be gained of each type for future guidance.

Switchgear required in connection with the three-phase feeders to May Street and Hurlingham sub-stations :—English Electric Co., Ltd. (£2,038); Ferguson Pailin (Recommended), (£1,938); General Electric Co., Ltd. (£1,990); Metropolitan-Vickers Electric Co., Ltd. (£1,998); A. Reyrolle & Co., Ltd. (£2,164).

Morecambe.—Corporation Entertainments Committee. Recommended. Illumination scheme (£2,400).—Smith & Co.

Portland.—Electricity Committee. Accepted. Cables (£2,754).—Pirelli-General Cable Works, Ltd. Kiosk (£63).—Yorkshire Switchgear & Engineering Co., Ltd. Sub-station equipment (£654)—Crompton Parkinson, Ltd.

Reigate.—Rural District Council. Accepted. Centrifugal pump and motor combined for Nutfield outfall works (£105).—Gwynnes Pumps, Ltd.

Seaham Harbour.—Housing Committee. Recommended. 136 electric wash boilers for Council houses (£4 16s. 6d. each).—Burnley Components, Ltd.

Electricity Committee. Accepted. Cables, excavations, &c., for extensions to Deneside estate (£1,767).—W. T. Henley's Telegraph Works Co., Ltd. Standards (£187).—Fairless Engineering Co. Miscellaneous goods (£92).—General Electric Co., Ltd.

Shropshire.—County Council. Accepted. Electrical work at the Berrington Hospital (£1,249).—G. H. Smallwood & Co., Ltd.

Shrewsbury.—Housing Committee. Accepted. Wiring of 100 council houses.—W. Thomassen & Co.

Stirling.—Town Council. Accepted. Installation of electric lighting in 75 houses.—James Scott & Co.

Ventnor.—Urban District Council. Accepted.—Electric motor for waterworks (£124).—Mather & Platt, Ltd.

Warrington.—Electricity Committee. Accepted. Transformers for twelve months.—Fuller Electrical & Manufacturing Co., Ltd.

Weymouth.—Town Council. Accepted. Installation of electric lighting in sixty-two houses (£434).—W. O. Knell.

Forthcoming Events

Association of Mining Electrical Engineers.—Saturday, May 28th. Esplanade Hotel, Porthcawl. 5.30 p.m. Annual meeting of South Wales Branch in conjunction with the West Wales Branch.

Birmingham Electric Club.—Monday, May 30th. Streetly. Golf competition.

Institution of Electrical Engineers.—May 30th-June 3rd. Harrogate. Summer meeting. *(North Midland Students' Section).*—Wednesday, June 1st. 9 a.m. Summer visit to Hull Docks. *(London Students' Section).*—Saturday, June 4th. Summer outing to s.s. *Empress of Britain* at Southampton Docks. *(South Midland Students' Section).*—Saturday, June 4th. 2 p.m. Visit to Ironbridge power station.

Royal Institution.—Friday, June 3rd. Institution, London. 9 p.m. "Electrical Conductivity of Metals at the Lowest Temperatures." Mr. J. E. M'Lennan.

Incorporated Municipal Electrical Association.—June 15th-18th. Cardiff. Annual convention.

Municipal Tramways and Transport Association, Inc.—June 22nd-24th. Grand Hotel, Eastbourne. Annual conference.

Electrical Contractors' Association.—June 28th-30th. Southport. Annual conference.

Overhead Lines Association.—July 1st. Chesham. Summer meeting.

Notes

Marelli Batteries

With reference to the article on "Electric Battery Vehicles" in our April 1st issue, we are asked to state that the Fiat vehicles mentioned as being in the service of the Società Servizi Pubblici Italiana are fitted with batteries manufactured in Italy by the Soc. Anon. Fabbrica Italiana Magneti Marelli under licence from the English D. P. Battery Co., Ltd., of Bakewell.

A Progressive Colliery

In our issue of April 29th we described the first M.-V. hydraulic slip regulator to be installed in Great Britain. This is in line with the progressive policy adopted by Messrs. Barber, Walker & Co., the owners of Watnall Colliery, who have installed, in conjunction with the Metropolitan-Vickers Electrical Co., Ltd., (*a*) the M.-V. Stubbs-Perry system of flywheel equalised turbo-electric drive, by means of which the d.c. generators supplying a winder, together with the equalising flywheel, are directly driven through reduction gearing by a high-speed condensing turbine. This system entirely separates the winder load from the colliery supply and ensures a uniform steam demand and its efficient utilisation. The first equipment was installed at the Harworth Colliery in 1924, and was followed by a second in 1925.

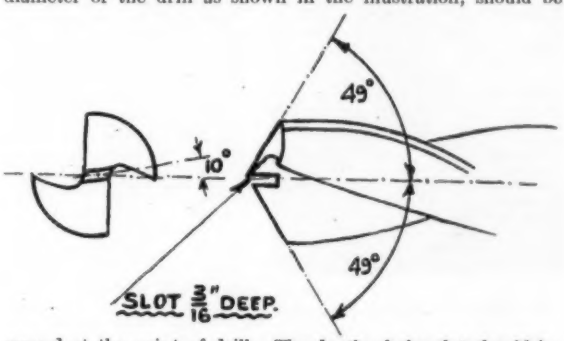
(*b*) The M.-V. patent two-lever system of winder control, which eliminates the separate lever for emergency tripping and resetting the brakes. A rocking lever interconnects the driver's brake lever and the brake engine; it is supported on a fulcrum which can be moved vertically, and is normally maintained at its highest position by a solenoid. Emergency braking is carried out by de-energising the solenoid, which permits the fulcrum to fall and applies the brakes fully, regardless of the position of the driver's brake lever.

(*c*) The Lilly controller, which provides complete protection against overwind, overspeed, and delayed retardation, and also compels the correct speed reduction on approaching bank. It is merely called upon to open an electric contact when prearranged limits are exceeded, and is in consequence constructed as an intrument of precision.

(*d*) The M.-V. patent brake governor, which limits the rate of deceleration of the cages under all conditions of speed and loading. Under emergency braking conditions a safe maximum rate is imposed, thereby keeping the stresses in the ropes and other portions of the winder within safe limits.

A Marble and Slate Drill

Frequently the engineer is called upon to drill holes in marble and slate for the purpose of fixing various electrical instruments and equipment. The accompanying diagram shows how an ordinary high speed twist drill can be made to suit this class of work. A small slot, depending upon the diameter of the drill as shown in the illustration, should be



ground at the point of drill. The depth of the slot should be at least 1/16 in., and care should be taken to arrange it slightly at an angle as shown. For the purpose of cooling the drill during operation, a solution of either turpentine or spirits of camphor will be found suitable.

Mining Engineers' Summer Meeting

The summer meeting of the Institution of Mining Engineers is to take place in Sheffield from June 15th to 17th. Among the five papers to be read there will be one by Mr. J. Ivan Graham on "A Photometer for Use in Mines," and Prof. W. Cramp will explain "Coal-face Lighting by Means of Magnetic Induction." The programme includes social and civic functions and visits to twelve works and factories, those of more direct electrical interest being the rolling mills of Steel, Peech and Tozer, Ltd., and the miners' lamp works of Ceag, Ltd., at Barnsley, and of Hailwood & Ackroyd, Ltd., at Morley, Leeds.

I.E.E. Students' Scottish Tour

The annual summer tour of the Students' Section of the Institution of Electrical Engineers is to take place in Scotland from July 30th to August 6th. There is to be a steamer cruise on the Firth of Clyde; motor coach tours of the "Three Lochs" and the Burns country from Glasgow and of the Scott country, including the Forth Bridge, from Edinburgh. There will also be visits to the Bonnington hydro-electric station of the Clyde Valley Electric Power Co., the Dalmarnock power station of the Glasgow Corporation, the India Tyre & Rubber Co.'s Inchinnan works, the Greenock sugar refinery of John Walker & Co., Carron Company's works, and the Shrubhill repair depôt and central garage of the City of Edinburgh's Transport Department. Proposed alternative extension tours (August 6th to 9th) will be to Fort William and the Lochaber hydro-electric works of the British Aluminium Co. by road or rail and water.

I.E.E. Western Centre Summer Meeting

The annual week-end summer meeting of the Western Centre and the Institution of Electrical Engineers was held at the Sedbury Park Hotel, near Chepstow, Gloucestershire. It commenced on Friday evening, May 20th, with the annual general meeting and declaration of ballot for committee vacancies, followed by dinner and a dance. On the Saturday there were alternative visits to the Edison Swan Electric Co.'s cable works at Lydbrook or the Lydney power station of the West Gloucestershire Power Co. A "treasure hunt" took place on the return journey, and a dinner and dance were held in the evening. On the Sunday there was a golf competition for the past chairman's cup, and on the following day members had the choice of a river trip or the inspection of grid overhead lines and sub-stations by arrangement with Mr. J. W. Beauchamp.

Appointments Vacant

Chief clerk for Southend-on-Sea Electricity Department.

Control room operator and senior switchboard attendant for Battersea power station.

Assistant mains superintendent for Blackburn Electricity Department.

(See our advertisment pages to-day.)

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following :—

MEL headphones.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir Charles Bright, F.R.S.E., M.Inst.C.E., M.I.E.E., &c., is the youngest son of the late Sir Charles Tilston Bright, M.P., who was knighted at the early age of 26 for laying the first Atlantic Cable, and the centenary of whose birth is the occasion for the publication of the article appearing on p. 772 of this issue of the ELECTRICAL REVIEW. Sir Charles followed the profession which made his father famous, and was many years ago connected with a number of cable-laying expeditions. In the year 1897 he reported to the Colonial Office on the Pacific Cable scheme, and during a lengthy career has served on many Government and other important committees dealing with cable matters, radio-telegraphy and aviation. He has also been closely identified with various public movements such as industrial co-partnership and industrial and international peace, and he is keenly interested in many other causes.

[Raphael.
Sir Charles Bright, F.R.S.E.

For some years past Sir Charles has been a sufferer from very poor health, but he has been very busy with his pen. He has produced a number of important works, included among them being his well-known "Submarine Telegraphs: Their History, Construction and Working"; "Science and Engineering during the Victorian Era"; "The Life of Sir Charles Bright"; "Telegraphy, Aeronautics and the War"; "The Story of the Atlantic Cable"; and, most recent of all, "Let's Help! A Collection of Good Causes," which made its appearance last year. He has been described as the historian of submarine telegraphy, and is a frequent contributor to the leading reviews. Sir Charles, upon whom the honour of knighthood was conferred in 1919, is in his sixty-ninth year.

Sir David J. Owen has been elected president of the Institute of Transport to take office on October 1st.

Mr. F. A. Orchard has resigned from the staff of Mr. David Maxwell-Buist, engineer-in-charge of the North-East electricity "grid" scheme, to take up a position as chief assistant to Mr. N. S. Fennant, general manager and engineer to the Newcastle and District Electric Lighting Co., Ltd. Mr. Orchard was formerly with Messrs. Merz and McLellan, the British Westinghouse Co., Dick Kerr & Co., British Thomson-Houston Co., Ltd., and Siemens Brothers Dynamo Works.

Mr. H. J. Choles has been appointed secretary of the South African Electricity Control Board in succession to Mr. A. B. Skothewe, and **Mr. H. J. Dewar**, chief accountant of the Treasury, and **Mr. J. L. Hill, M.I.E.E. (S.A.)**, have been re-appointed members of the Board.

The Earl of Selborne has resigned from the chairmanship of the Telegraph Construction & Maintenance Co., but will continue as a director. **Mr. Colin F. Campbell** is the new chairman. Other changes in the company include the retirement

[Lafayette.]
Sir Geoffrey Clarke **Mr. Willoughby Smith**

as from April 30th of **Mr. Willoughby Statham Smith, M.I.E.E.**, from the joint managing-directorship and from the board. **Sir Geoffrey Clarke**, who has been joint managing-director with him, is now sole managing-director. Mr. Willoughby Smith, who is seventy-two years of age next September, joined the company fifty years ago as from January next (1883). He was appointed manager of Wharf Road Works in 1888 and joint managing-director in March, 1909; he has been senior joint managing-director as from January, 1926. As many of our readers are aware, Mr. Smith was responsible for the introduction of many important improvements in connection with submarine cables. Through his father and himself, the name Willoughby Smith has been continuously connected with submarine telegraphy for eighty-four years.

Mr. W. D. Watson has been elected chairman of the Rochdale branch of the Electrical Contractors' Association for the sixth year in succession. For twenty years Mr. Watson has been delegate to the Northern Section of the E.C.A.

Mr. R. Lessing has moved his laboratory and his consulting practice is now being carried on at 50, Queen Anne's Gate, Westminster, S.W.1.

Mr. Leslie C. Sharp and **Mr. Bernard Sleath** have been appointed joint sales managers of Venner Time Switches, Ltd., upon the reorganisation of the sales department consequent upon increased business and the company's entry into the meter branch.

Mr. R. A. W. Connor is resigning his position as junior technical engineer at Worcester Corporation Electricity Department to take up a similar position with the Battersea Council.

We understand that **Sir Bernard Greenwell**, chairman of the County of London Electric Supply Co., Ltd., has joined the board of Edmundsons' Electricity Corporation, Ltd., and has been elected chairman.

Mr. H. Williamson, author of the article entitled "An Industrial Change-over," which appears on p. 767 of this issue, is chief engineer to Messrs. Henry Wiggin and Co., Birmingham. He was responsible for the scheme which he describes in the execution of which he had the assistance of the design departments of the makers of the l.p. distribution board. Mr. Williamson is an associate member of the Institution of Electrical and Mechanical Engineers.

[Whitlock & Sons.
Mr. H. Williamson, author of the article on page 767

Mr. C. S. Taylor, vice-president and general manager of the Shanghai Power Company, left Shanghai for England *via* the United States early this month. He expects to reach this country by the middle of July and will remain here until late October. His address will be c/o Messrs. John Pook & Co., 68, Fenchurch Street, London, E.C.3.

Mr. B. Waite, district manager of the South Wales Telephone District, retires shortly. He will be succeeded by **Mr. A. E. Ryland**, Traffic Superintendent of the Newcastle-on-Tyne District.

Obituary

Lord Inchcape.—The death is reported at the age of 79 of the Earl of Inchcape, which occurred on May 23rd on his yacht at Monte Carlo. He was a director of many companies, including Cables & Wireless, Ltd., Imperial & International Communications, Ltd., and Marconi's Wireless Telegraph Co.

Mr. G. B. Crompton.—The death occurred on May 14th, at the age of 77 years, of Mr. George Bambridge Crompton, electrical engineer, of Woodfield House, Woodfield Terrace, Bury, Lancs.

Mr. J. A. Lycett.—We regret to learn of the death of Mr. James Albert Lycett, of Lyndholm, Kidderminster, District Superintendent of the British Electric Traction Company. Mr. Lycett, who was 67 years of age, had been connected with the company since its earliest days and was actively engaged in the inauguration of electric tramways in the Birmingham and Midland areas. He was a member of the Council of the British Electrical Federation, Ltd., and a director of various companies.

Mr. S. G. Lang.—The death has occurred at Bedford of Mr. S. G. Lang, at the age of 56. Mr. Lang was formerly connected with British Insulated Cables, Ltd.

Mr. E. A. Jones.—The death took place on May 18th of Mr. Edmund Ardron Jones, who, in 1916, established the business of the Advance Electrical Co. at Tunbridge Wells.

Mr. W. May.—The death has occurred at the age of sixty-nine years of Mr. William May, of Ashburton House, Send, a director of the Reading Electric Supply Co., the Greater London & Counties Trust, and other electricity supply companies. He was senior partner of the firm of Slaughter & May, solicitors.

Will.—Mr. F. A. Smith, a director of the South Wales Electric Power Distribution Co., and the South Wales Power Co., left £50,151 (net personalty £48,189).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

W. Winstanley, Ltd.—Private company. Registered May 17th. Capital £100 in £1 shares. Objects: To adopt an agreement with W. Winstanley, and to carry on the business of electricians, radio and electrical engineers, &c. The subscribers are:—W. Winstanley and Mrs. D. C. Winstanley, both of 47, Edge Lane, Liverpool. Secretary: W. Anderson, 81, Dale Street, Liverpool. Registered office: 47, Edge Lane, Liverpool.

Switchgear and Equipment, Ltd.—Private company. Registered May 18th. Capital £10,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, hydraulic, and general engineers and contractors, &c. The subscribers are:—A. MacGregor, 80, Ashburton Avenue, Croydon; and H. W. Huxham, 65, Whidborne Buildings, Argyle Square, W.C.1. Solicitors: Cardew Smith & Ross, 27, Ely Place, E.C.1.

Electrical Equipment Repair Service, Ltd.—Private company. Registered May 18th. Capital £100 in £1 shares. Objects: To carry on the business of general repairers of electrical and mechanical equipments, manufacturers of and dealers in fittings and apparatus for lighting, heating, and power. The permanent directors are:—W. H. Bray, 30, Highbury Gardens, Seven Kings, Essex; and R. C. Coleman, 68, Norman Road, Ilford Lane, Ilford, Essex. Registered office: Salway Hill, High Road, Woodford Green, Essex.

T. Horton & Son, Ltd.—Private company. Registered May 23rd. Capital £1,250 in £1 shares. Objects: To carry on the business of manufacturers of, agents and dealers in, electrical fittings, etc., including things capable of being used in connection with radio or wireless telegraphy. The first directors are: T. Horton, 199, Chichester Road, North End, Portsmouth, and W. J. Steele (chairman), "Craiglea," 21, Oak Road, Southampton.

Atco (Reels), Ltd.—Private company. Registered May 19th. Capital £500 in £1 shares. Objects: To adopt an agreement with W. Dagwell for the acquisition of the trade mark "Atco," No. 517,645, relating to cardboard reels for electric cables, and to carry on the business of manufacturers of such reels formerly carried on by the said W. Dagwell at Oldbury, near Birmingham. The subscribers are: W. Dagwell, 203, Willow Avenue, Edgbaston, Birmingham, and J. J. Ward, 16, Emily Street, West Bromwich, Staffs. Secretary: W. Dagwell. Registered office: Park Lane, Oldbury, Worcs.

Amplion (1932), Ltd.—Private company. Registered May 23 with a nominal capital of £600 in £1 shares. Objects: To carry on the business of manufacturers and retailers of and dealers in goods in connection with wireless telegraphy, telephony, and television, and the servicing of the products of Graham Amplion, Ltd., in accordance with an agreement dated May 6th, 1932, and to acquire from the said company the benefit of certain trade marks in pursuance of such agreement. The subscribers are: A. T. Winfield, 131, Grant Road, S.W.11, and A. Kinge, 58, Montana Road, S.W.17. Registered office: Sentinel House, Southampton Row, W.C.1.

Block Batteries, Ltd.—Private company. Registered May 23rd. Capital £150 in 1s. shares. Objects: To carry on the business of mechanical and electrical engineers and contractors, manufacturers of accumulators and primary batteries, etc. The first directors are: E. W. Sudlow, 39, Holcombe Road, Ilford; L. Fuller, 2a, Courtfield Gardens, S.W.; and G. J. A. Fuller, Brooklyn, Loughton. Registered office: 13, High Road, Ilford.

Returns of Electrical Companies

Berolif, Ltd.—Debenture dated April 22nd to secure £60, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: G. S. Simmonds, 105, Perry Hill Road, Quinton, Birmingham.

E. Shipton & Co., Ltd.—Debenture dated May 10th to secure £4,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Telephonfabrik Berliner A.G., Berlin, Germany.

Sun-Ray Electric Lamp Co., Ltd.—E. Morter, of Woodlands Avenue, Hornchurch, ceased to act as receiver and manager on April 18th.

Radio Company of Great Britain, Ltd.—Capital, £100 in £1 shares. Return dated January 14th, 1932. All shares taken up. £100 paid. Mortgages and charges, nil.

Electrical & Radio Products (1931), Ltd.—Debenture dated April 27th, to secure £2,442, charged on land, factory, and cottages in Horley, Surrey, and the company's undertaking and other property, present and future, including uncalled capital. Holder: C. H. Collins, 123, Clarence Gate Gardens, N.W.

London Radio Manufacturing Co., Ltd.—Capital £1,000 in £1 shares. Return dated January 14th, 1932. All shares taken up. £700 paid. £300 considered as paid. Mortgages and charges: Nil.

Stuarts (Radio), Ltd.—Mortgage debenture dated April 22nd, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: E. H. Hawkins, 4, Charterhouse Square, E.C.1.

Welsh Radio & Electrical Supplies, Ltd.—Particulars filed of £300 debentures authorised April 7th, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

Freedman Valve Co., Ltd.—Debenture dated April 18th, to secure £1,932 10s., charged on the company's undertaking and property, present and future, including uncalled capital. Holder: S. de Laszlo, 6, Stanhope Place, W.1.

Modern Radio, Ltd.—H. Lomax, of 83, Bridge Street, Manchester, ceased to act as receiver on April 26th.

Radio Relays, Ltd.—Capital, £7,500 in 6,750 preference shares of £1 each and 15,000 ordinary shares of 1s. each. Return dated January 4th, 1932. 3,675 preference and 15,000 ordinary shares issued and fully paid up. Mortgages and charges, nil.

Baird Television, Ltd.—Capital, £825,000 in 2,100,000 10 per cent. non-cumulative preferred ordinary and 1,200,000 deferred ordinary shares of 5s. each. Return dated January 13th, 1932. All shares taken up. £315,000 paid on 1,050,000 preferred ordinary (including premium of 1s. per share). £562,500 considered as paid on 1,050,000 preferred ordinary and 1,200,000 deferred ordinary. Mortgages and charges, nil.

City & General Radio Co., Ltd.—R. R. Goding, of 20, Chatsworth Gardens, Acton, W.3, ceased to act as receiver and manager on April 25th.

Independent Battery Co., Ltd.—W. J. Moriarty, of 23, Holmes Road, Kentish Town, N.W.5, was appointed receiver on May 9th, under powers contained in debenture dated April 13th, 1932.

Mutter, Sanders & Co., Ltd.—G. T. Needham, of 4, Dock Chambers, Bute Street, Cardiff, was appointed receiver on May 10th, under powers contained in debenture dated March 16th, 1931.

Wireless Services, Ltd.—Particulars filed of £5,000 debentures and premium of 5 per cent. authorised April 25th, 1922, charged on the company's undertaking and property, including uncalled capital, the amount of the present issue being £200.

City Notes

The International Telephone & Telegraph Corporation, in its report for 1931, states that its manufacturing business abroad, while declining materially from the levels of 1929 and 1930, showed a substantial overall net profit. The telephone operating properties which, except for the Porto Rico plant, are located entirely in foreign countries, as a whole materially improved their results over the previous year. The Corporation suffered, however, with respect to its properties in the United States, which are almost wholly telegraph, cable and radio operating properties. Further economies have been made, as a result of which it has been possible to arrive at a balance in the financial budget. Postal Telegraph increased its percentage of participation in the total land line telegraph business of the country. While the total domestic telegraph business of the United States decreased by approximately 16 per cent. in 1930, the Postal Telegraph suffered a decrease of only 8 per cent. The message revenue of the Commercial Cable Co. in 1931 declined by 19.4 per cent. as compared with 1930, while message revenue of All America Cables declined by 29.3 per cent. During 1931 the revenue messages handled by Mackay Radio increased by approximately 17 per cent. over 1930, and the number of ships with which it has contracts for ship to shore service increased by 67 per cent. The combined gross operating revenues of all of the Corporation's associated telephone companies, including the Spanish Telephone Co., placed on a comparable basis with the year 1930, showed an overall increase of 3.2 per cent. At the same time, net operating revenues on a like basis increased by 15.5 per cent. Eliminating the Spanish Telephone Co., net income from all telephone operating companies included in the consolidated statement of income showed an increase of 10.6 per cent. over the corresponding figures for 1930. During the year the total of telephones in service increased from 688,052 to 769,920. Of this increase some 50,000 are accounted for by the addition of the Rumanian system which was acquired as from January 1st, 1931. The balance of over 30,000 stations represents a net overall increase of telephones in service in systems acquired before 1931. One of the Corporation's major activities is the manufacture of electrical equipment related to telephone, telegraph, cable and radio operations. The total sales for all manufacturing companies outside of the Federal-Kolster group which was acquired in 1931 were $61,310,000, as compared with $80,323,000 in 1930. The decrease in sales brought about a decline of $2,547,000 in net income. These companies, however, closed the year with an overall net income of $5,876,000. In June of last year a contract was made, pursuant to which Kreuger & Toll delivered to a Swedish bank for account of the Corporation 610,000 shares, of the par value of 50 kroner each, out of a total of 2,016,626 shares outstanding of L. M. Ericsson Telephone Co., Ltd. Part of the consideration, consisting of $11,000,000 in cash, was paid, the contract providing that the balance should be paid in stock of this Corporation against an additional amount of Ericsson stock. The exact amount of the stock of this Corporation to be delivered was to be dependent upon the result of an audit of the Ericsson Co. based on its operations for the year 1931. Early in the present year, however, and before the delivery of any of the stock of this Corporation, certain representations of fact, upon which the agreement was based, were found to be inaccurate and the entire arrangement was accordingly rescinded, thus terminating any obligation on the part of this Corporation to deliver any of its own shares. Under the arrangements made, the stock of the Ericsson Co. previously delivered is held by the Swedish bank for the Corporation's account as collateral security for the repayment of the amount already paid.

S. Smith & Sons (Motor Accessories), Ltd., announced that while earnings warrant the payment of an interim dividend on the preferred ordinary shares, the question of payment has been postponed until the end of the financial year in view of the existing general trading and financial conditions. The company's general business is maintaining its position, and the new section—*i.e.*, British clock making—is now established on a profit-earning basis.

The Urban Electric Supply Co., Ltd., held its annual general meeting on May 19th, Mr. P. D. Tuckett (chairman) presiding. Dealing with the accounts for the past year (ELEC. REV., May 13th, p. 721), the chairman said that apart from the Cornwall Electric Power Co., the development of the company's business showed steady progress, an additional 5,200 kW having been connected during the past year by their undertakings and those of sub-companies, while their output increased by a little over a million kWh, despite some reduction in the industrial power load at Hawick and Grantham. The Cornwall Electric Power Co. had, however, suffered severely from the shutting down of the tin mines, its output having declined by nearly 50 per cent., despite a 47 per cent. increase in the sale of electricity in bulk to the company's Cornish distribution undertakings. They were doing everything in their power to stimulate the development of this bulk load so as to lessen their dependence on the mines. Lately there had been a slight increase in the demands of one or two of the mines, but until the price of tin rose very substantially above the figure at which it had now stood for the best part of two years, it was difficult to see how there could be any sustained recovery in their working. However, a welcome jump of £10 or £15 a ton occurred a fortnight or so ago as a result of the further drastic restriction scheme recommended by the Tin Producers' Association. Whether this scheme would be successful in effecting the object it had in view remained to be seen, but should the price of tin be raised to £200 a ton, as was contemplated, the general outlook in Cornwall would be much improved. The results were not unsatisfactory under the conditions prevailing last year, with no dividend from the Cornwall Power Co., and with a return from gilt-edged investments and from their small new undertakings in Cornwall substituted for the larger return previously derived from their Godalming, Weybridge, and Twickenham undertakings. The outstanding feature of the balance-sheet was the extremely strong financial position in which the company had been placed by the sale of these undertakings. It would be still further strengthened during the current year by the recent sale to the London and Home Counties Joint Electricity Authority of their Caterham undertaking. The report and accounts were unanimously adopted.

Callender's Cable & Construction Co., Ltd., reports a credit balance for 1931 of £274,660 on the profit and loss account, as compared with £320,036 in 1930. From this is deducted £107,000 for depreciation of buildings, plant, &c., preference dividend and debenture interest, and after adding £351,664 brought in, less £59,870 transferred to renewals and contingencies account, there is a balance of £459,454 available. The ordinary dividend is maintained at 15 per cent., and £292,054 is carried forward. The report states that the holding in the Surbiton undertaking and of the South Wales Power Co., Ltd., has been disposed of on terms which have given a substantial addition to the cost at which they stood in the company's books. The increased demand for electricity which was expected to result from the operations of the Central Electricity Board and the extended use of the grid has not yet materialised to the anticipated extent, but continual progress is being made and new areas of supply connected up. The use of electricity for industrial purposes, which suffered a diminution during the recent depression, is now gradually increasing, whilst the demand for domestic supplies is developing satisfactorily. In spite of the troubles in India, the company has had a considerable amount of work there, with good results, and its operations in that country are still being carried through in spite of the unrest. The continued crisis in the United States seriously interfered with electrical development in every part of America, but the Okonite-Callender Co. has secured considerable orders and has maintained its position. The business of the Anchor Cable Co., Ltd., has been maintained, although it has been curtailed by the depression. The results on the whole are satisfactory. A new Research Department has been equipped during the year at Shepherd's Bush, and additional new machinery has been erected at the Erith factory to cope with the increasing pressures which are now being called for. The jubilee of the company, which was reached on April 19th last, is recorded, as is also the appointment of Mr. T. O. Callender to the board. Meeting: May 31st.

The Oriental Telephone & Electric Co., Ltd. held its annual meeting on May 20th, when Sir A. Henry McMahon (chairman), who presided, in presenting the report and accounts (ELECTRICAL REVIEW, May 13th, p. 721), said that they were to be congratulated both on maintaining the dividend at 12 per cent. and also on being in a position to make a small additional distribution to commemorate the jubilee of the company's foundation. The company's ample liquid financial position was a great strength in these difficult times. Referring to the branches at Singapore and Mauritius, he was afraid he was unable to record any improvement. In Singapore the chief cause of the depression was the rubber position, the price of that commodity having fallen to no more than 2d. per lb. to-day. Another important commodity was tin, which had fallen from nearly £400 a ton in 1918 to £125 a ton to-day. Their business in Singapore was weathering the economic blizzard; economies had been effected, and the new automatic installation had resulted in a substantial reduction in cost of operation. The improved state of the Bombay Telephone Co., mentioned in last year's report, had been maintained, and the prospect was certainly brighter, though too much must not be expected in the immediate future. In Calcutta the effects of the political and economic difficulties had been felt in a marked degree by the Bengal Telephone Corporation, and recovery was likely to be slow. The previous year's dividends had been maintained by the Rangoon Telephone Co., the Madras Telephone Co., and the China & Japan Telephone & Electrical Co. In spite of the civil strife and commotion in China, the fortunes of the Hong Kong Telephone Co. continue to improve, the net profit for the year having increased from $336.624 to $371.580, and the number of subscribers from 9,156 to 10,317. Sir Henry then reviewed the progress made by the company during the fifty years of its existence. He said the company was registered on February 4th, 1881, with an ambitious programme. Its object was to introduce the telephone into India, the Straits Settlements, China and Japan, South Africa, Australia, Egypt and other countries. The programme originally emanated from America, and was for the exploitation of the invention of Dr. Graham Bell in all civilised countries of the world. Its first directors included Sir John Pender, Sir Julius Vogel, Sir Alexander Armstrong, Sir William Thomson (Lord Kelvin), A. Graham Bell, T. A. Edison, and Col. Gourand. The speaker related the story of its progress, changes in the programme, and the extension of its operations to include other electrical work. The difficulties of the war period and the fictitious prosperity which followed it were mentioned, as were also the different depression-periods through which the company had successfully passed. To-day they were again looking forward to the dawn of renewed prosperity.

Philips Incandescent Lamp Works Holding Co., in its report for 1931, states that there was a further decline in turnover due to diminished purchasing power, import prohibitions, foreign exchange restrictions, &c. The fall of sterling, as well as of other currencies, brought about a considerable loss, which would have been greater if they had not covered themselves partly through forward sales of exchange. It is proposed to charge the loss on exchange on their outstanding debts, viz., Fl. 2,287,474, to profit and loss account. Various economies have been effected, and a reduction in salaries and wages was unavoidable in order to keep at least part of the export market for the sale of their products of Dutch make. The bad conditions prevailing in the international goods and money markets have made compulsory a considerable decentralisation of production apparatus, and, consequently the locking up of considerable amounts abroad. In the company's laboratories a new source of light has been developed, having a consumption of current considerably below the existing one. The turnover in the first quarter of the current year is lower than for the corresponding period of 1931, but the company expects to counteract the unfavourable influence of a diminished turnover by economies. As reported in our issue of May 20th, p. 757, a dividend of 4 per cent. (against 6 per cent.) is proposed on the ordinary shares, leaving an undivided balance of Fl. 287,983 to be carried forward.

The Electrical Finance & Securities Co., Ltd., in its report for 1931 shows a net profit of £24,260 (as against £20,107 in 1930). The ordinary dividend is 10 per cent., plus a bonus of 2½ per cent. (same), and £9,552 is carried forward.

The annual general meeting was held on May 20th. Mr. G. H. Nisbett (chairman and joint managing director), who presided, said that since last year the authorised and issued capital had been increased, in the case of the ordinary shares from £150,000 to £200,000, and in the case of the preference shares from £100,000 to £150,000. Those additions to capital, as well as the issue of an additional £100,000 of debentures at the beginning of this year, had been necessitated by the continual growth of their subsidiaries and by the need to pay off the company's indebtedness, mostly owing to its own group. The result for the year was a net balance of £24,260 after payment of debenture and other interest, transfer to sinking fund and smaller charges. To that was added £9,325 brought forward, making £33,585 available. It was proposed to pay a final dividend of 5 per cent. and a bonus of 2½ per cent., making a total of 12½ per cent. for the year (same). A sum of £9,552 would be carried forward. Considerable reductions in the charges for electricity had been made by some of the subsidiary companies during the year, and further reductions would be made as circumstances permitted. The chairman thought that, having in mind the times that they were passing through, they were to be congratulated upon the results. The number of consumers of their subsidiary companies had increased by 18 per cent., the total kilowatts connected by 25 per cent., the kWh sold by 17½ per cent., the gross revenue by over 11 per cent., and the reserves—now aggregating £253,500—by 20 per cent.

Dutch Wire & Cable Works (Hollandsche Draad en Kabelfabriek).—The report states that it appeared at the beginning of 1931 that the year would develop rather more favourably than the preceding one. But the fall in the prices of raw materials combined with declining sale prices and losses on exchange brought about a loss for the year, although the turnover was almost on the level of that of 1930. With regard to the future, the report mentions the restrictions placed by other countries on imports and the regulation of exchange, and says that the Dutch market will be unable to afford compensation for this loss of exports, especially as the needs of the home market are largely declining. The accounts show a debit balance of 69,713 fl. without taking depreciation into account, as compared with a gross surplus of 248,840 fl. in 1930, which permitted of provision being made for depreciation. A dividend of 7 per cent. was paid in 1929.

Siemens Bros. & Co., Ltd., report a profit for the year ended December 31st last, after allowing £9,767 for pension fund contribution and retiring allowances of £310,908, as compared with £335,114 in the preceding year. The ordinary dividend is maintained at 7¼ per cent., and the amount carried forward is £372,155, as against £367,436. The report states that the turnover, arising from the unsettled world financial conditions, was lower in 1931 than in 1930, and there was a corresponding decrease in profits. The depression has been chiefly felt in the cable shops at Woolwich, where the output of electric light and power cables as well as of telephone cables has been lower than for many years, whilst orders for submarine telegraph cables have still further shrunk. The cable steamer *Faraday* was unemployed throughout the year, but has been kept maintained ready for service. Meeting: To-day (Friday).

Edmundsons' Electricity Corporation, Ltd., is offering for public subscription (the list opened yesterday) an issue of 1,250,000 six per cent. cum. preference shares of £1 each at 21s. per share. The proceeds will be applied towards payment of the cash consideration payable to Greater London & Counties Trust, Ltd., for assets agreed to be acquired from it. At an extraordinary meeting held on Tuesday last a resolution was approved increasing the capital to £6,000,000 by the creation of 2,000,000 preference and 850,000 ordinary shares.

The Consolidated Gas, Electric Light and Power Co. of Baltimore announces a dividend of 90 cents per share (same) for the quarter ended June 30th.

Whitehall Electric Investments, Ltd., held its annual meeting on May 24th, the Hon. Clive Pearson (chairman) presiding. In presenting the report and accounts (ELEC. REV., May 20th, p. 757), the chairman said the investments of the company and of the subsidiaries, Hallminster Investments, Ltd., and Whitehall Canada, Ltd., in which they owned 85 per cent. of the share capital, had a book cost of £13,271,000, divided as follows:—Controlled electrical undertakings in Athens, Lecrin (Spain), and in the West of England, £3,589,000; short term electrical investments, £2,162,000; other electrical investments, £3,573,000; non-electrical investments, £3,947,000. In the West of England properties, the main 33,000-V transmission system now extended across Devon and Somerset, from Exmouth in the South to Williton in the North, thus linking to Minehead, and this, with an 11,000-V line from Minehead to Porlock, which was shortly to be put in hand, would complete the initial scheme of interconnection. A number of villages had been connected during the year, and a campaign was being pursued for the hire and hire-purchase of electrical appliances and the wiring of premises on deferred terms. The undertakings at Crediton and Budleigh Salterton had been acquired, and with these additions their interest in the West of England approached £1,000,000, and a subsidiary, entitled West of England Electric Investments, Ltd., had been formed to hold this investment. Good progress had been made by the Electricity Co. in Athens, while the new hydro-electric plant at Izbor for the Lecrin Co., in Spain, was expected to be ready for operation before the end of the year. Reviewing their position generally, the enterprises where they had a shareholding control all held good promise for the future. The controlled properties were all in the stage of early development, and he was confident that their aggregate earnings which were low at present, would show satisfactory increments; the extensions and reconstruction work of the past two years were now well forward, and would surely be followed by a growth in sales and earnings.

The Madras Electric Supply Corporation, Ltd., held its annual general meeting on May 18th, Mr. John G. B. Stone (chairman) presiding. In presenting the report and accounts (see our last issue, p. 757), the chairman said that on the whole very gratifying progress had been made during the past year, not only in financial results but in the improvement of their generating station and distribution system. They could now claim after several years' changes and improvements to possess a really up-to-date undertaking. The decrease in receipts from private lighting and fans was entirely due to consumers exercising strict economy in consumption consequent on depressed conditions of trade. Fortunately, however, the increased demand for power had more than counteracted this. The report and accounts were unanimously adopted, and at an extraordinary meeting which followed a resolution was passed increasing the capital of the corporation from £800,000 to £1,100,000 by the creation of 150,000 preference and 150,000 ordinary shares of £1 each

William Beardmore & Co., Ltd.—Presiding at the annnal general meeting on May 18th, Mr. H. A. Reincke (chairman and managing director) said that there was a rapidly increasing number of inquiries for Diesel and Diesel-electric equipments from all parts of the world, and they could look forward to substantial orders as soon as monetary conditions enabled potential customers to place their orders on acceptable terms. Attention had been devoted to the improvement in the design of a very complete range of engines, and they had recently received an order from a foreign Government for two engines, which he hoped might be the precursor of orders for larger numbers. Reports on the operation of the Diesel-electric rail-cars on the Pamplona-San Sebastian Railway had been eminently satisfactory.

The Ericsson Telephone Co.—A report issued last week by the committee which has been investigating the affairs of the Kreuger companies states that the position of the Ericsson Telephone Co. seems to be that a considerable part of the share capital can be considered as intact provided that the difficulties connected with the company's cash position can be overcome. Negotiations are being continued, but have not yet led to any agreement.

Imperial & International Communications, Ltd., reports that the estimated traffic receipts for the four months ended April 30th last were £1,648,463, an increase of £10,720, as compared with the corresponding period of 1931. It is pointed out that in comparing aggregates regard must be had to the notes issued with the traffic figures from March, 1931, to February, 1932.

The Sphere Investment Trust, Ltd., reports a credit balance on revenue account for the year ended March 31st last of £37,412, which with £3,622 brought in makes £41,034 available. It is proposed to pay an ordinary dividend of 3 per cent., less tax (against 4½ per cent. in the preceding year), leaving £7,659 to be carried forward.

The Potteries Electric Traction Co., Ltd., reports a revenue for 1931 of £361,764 and a surplus of £68,497, which with £7,965 brought in makes £76,462. Debenture and loan interest absorbs £18,629, and provision for renewals £40,200, the balance of £17,633 being carried forward.

The Georgia Power Co.'s accounts disclose a decrease from $13,261,683 to $13,005,646 in the net profit for 1931. After providing for interest charges, dividends, &c., there was a balance of $2,874,630, as compared with $4,184,970.

The Swansea Improvements & Tramways Co. reports a loss of £3,303 for 1931, against a profit of £13,187 for the preceding year. No dividend is recommended (6 per cent. in 1930), and £4,137 (£7,440) is carried forward.

The Pacific Gas & Electric Co. reports a net revenue of $51,024,001 for 1931, an increase of $2,075,685. After making provision for interest, depreciation, &c., there was a balance of $4,789,597 ($4,910,569).

The Adelaide Electric Supply Co., Ltd., has declared an interim dividend on the ordinary stock of 4½ per cent. actual, tax free, for the half-year ended February 29th last.

The Canadian General Electric Co. has announced the usual quarterly dividend on the common shares of $1 per share, being at the rate of 8 per cent. per annum.

The Telsen Electric Co., Ltd., has made an issue of 60,000 £1 shares at £3 per share, the offer for sale being made by the Midland Trust, Ltd.

Stocks and Shares

TUESDAY EVENING.

THE eyes of the investor wait upon some announcement expected to be made at any time from June 1st onwards, with reference to conversion of the five per cent. War Loan. It may be thought that too much iteration of this factor is a feature of financial reports of all kinds, but in point of fact the consideration outweighs all other matters relating to stocks and shares at the present time. Its possibilities extend to a constantly widening circle of investments, so far, even, as those of the ordinary shares in industrial companies. Those of the latter which, for example, command the respect accorded to London Electricity supply shares, are closely affected by the likelihood of early War Loan conversion. Some people think that the Government will elect to wait, before making any statement, until the conclusion of the Lausanne Conference. Seeing that the result of this Conference is awaited with no particular enthusiasm or expectation of definite progress being accomplished, it may be that June 1st, when the War Loan interest becomes payable, is the more probable date upon which the Government will make some statement concerning the outlook. Meanwhile, although there has been considerable reaction from the best in the prices of gilt-edged securities, a reaction due to profit-taking, the decline is insignificant as compared with the previous rises. Central Electricity 4½ per cent. debenture has risen 2 points to 97½, and at the same level London & Home Counties 4½ per cent. debenture show a gain of a point. The other gilt-edged stocks in the markets connected with electrical securities have held their ground firmly, with little setback from the recent highest prices touched.

Bedfordshire Electrics

Bedfordshire, Cambridgeshire & Huntingdonshire Electricity Company proposes to create £250,000 5 per cent. debenture stock, and to increase the capital by 250,000 ordinary shares of £1 each. The meeting to approve the proposal is being held on the Friday in this week. In the last issue of the ELECTRICAL REVIEW, page 757, it was mentioned that Edmundson's Electricity Corporation, in its proposal to increase the share capital to £6,000,000, announced that the additional capital is required, amongst other things, for the purpose of acquiring shares in the Bedfordshire undertaking. The Edmundson's meeting was held to-day, Tuesday. There is no market in the Stock Exchange for the shares of the Bedfordshire Company. As a matter of personal interest, it may be observed that Sir Bernard Greenwell, chairman of the County of London Electric Supply Company, has been elected to the Board of the Edmundson's Electricity Corporation. Sir Bernard Greenwell is the senior partner in the Stock Exchange firm which bears his name, and has been a member of the House for the past thirty years.

Home Electricity Supply Shares

Chelsea ordinary have improved to 27s. 6d., South Londons to 28s. 6d., and Urban ordinary to 28s. 9d. The preference list is being searched for investments that offer anything like 5¼ to 5½ per cent. on the money. North Metropolitan Electrics 6 per cent. preference strengthened to 25s., at which the return is £4 16s. per cent. Edmundson's preference, with a rise to 26s. 6d., pay a shade over 5¼ per cent. The recently issued Scottish Power new 6 per cent. preference, which came out at 23s., can be bought at 23s. 9d., at which the yield is 5 1/16 per cent. on the money. The British Light & Power new 6 per cent. preferences are changing hands on the basis of their par price. The issue was over-subscribed, but on the opening of the market it appeared as though the shares had been mildly stagged, and that there were a few fidgety sellers who wanted to get out of their holdings. North Somerset new preference are quoted at 9d. premium. County of London new ordinary have reacted to 2s. 3d. premium. Mid-Cheshire new ordinary are 2s. premium. There would be a good deal more activity in electricity supply shares were there a larger volume of supply with which to satisfy the would-be buyers. As it is, shareholders prefer to retain their interests at a time when good investments are difficult to obtain. In the matter of debenture stocks, something like a famine has developed.

Dollar Stocks

No recovery has occurred in the Transatlantic group. Affairs in America and in Canada are read as moving towards a crisis. It is thought that only by a general sinking of differences, and a coming together to hammer out a policy for the common good can the conflicting interests in America avert financial disaster. American, Canadian, and South American utilities are weak. Shawinigan have fallen back to 12, Power Corporation of Canada to 10, Montreal Light & Power to 31½. Of the Brazilian issues, Rio de Janeiro first mortgage bonds at 95¼ are 2 points down. Brazilian Tractions are a point lower at 11.

Mexicans have suffered fresh falls. A drop of 7 points reduced Mexico Tramways 5 per cent. bonds to 25½. Mexican Light & Power fives are 3 down, at 54½. Of the sterling bonds, Tokio 6 per cents. are firmer at 61.

Telegraphs and Telephones

The Imperial and International Communications, which is the operating arm of Cables & Wireless, announced a slight improvement in traffic during April, when an increase of £6,588 was secured over the traffics of April last year. For the first four months of the current year the aggregate is about £11,000 up, but allowance has to be made for certain adjustments in respect of January and February. The prices of the stocks have gone back after their recent modest rallies, and the 5½ per cent. preference is 3 down at 38½, the "A" ordinary being 2 lower at 12. Globe Telegraph & Trust ordinary shed 10s., going back to 4. Marconi Marines are 9d. lower at 23s. 9d. The American group is heavy. American Telegraph & Telephone fell 5 points to 130. Internationals have gone back to 6.

Cable Prior-charge Issues

The prior-charge stocks of the Eastern Telegraph group have come on offer, Eastern Telegraph 4 per cent. debenture, for example, at 77½ being 2 points down. Eastern Extension 4 per cent. debenture weakened to 78½; on the other hand, Eastern Telegraph 3½ per cent. preference at 54½ shows a small improvement. Telephone & General 7 per cent. preference strengthened to 1½. Anglo-American Telegraph preferred is down 10s. and the deferred stock £1, in consequence of the slump in all American industrials. The dividends upon these two stocks are met by a rental, paid to the Anglo-American Telegraph Company, by the Western Union.

The Home Railway Market

After the recent flutter of excitement in Metropolitan Consolidated stock, it is not altogether surprising that the price should have reacted a trifle upon the absence of any definite information in regard to what may be the company's position in the London Traffic pool. Rumour has been busy of late with optimistic talk concerning modified terms said to have been offered to the Metropolitan Railway, and it is this which has brought about the substantial recovery in the price of the stock. Now, however, the market has halted, and waits for official information. The price is a point down at 43½. The other Underground issues keep steady, Underground ordinary shares attracting a little speculative attention. Some Government statement, according to a very vague report, may be published before the end of the current six months, in connection with the competition which exists at present between the railways and the roads, though this is a matter which would hardly affect the stocks of the Underground companies, except by sympathy. The 5 per cent. debenture stocks of the District and the Metropolitan Railways are unchanged at 7½ premium. Metropolitan Railway 5 per cent. preference stock has risen 3½ to 80½.

British Electric Traction deferred, after three successive falls in as many weeks, recovered 25 points, and the preferred ordinary advanced 4 to 675 and 125½ respectively.

Manufacturing and Equipment

Callender's ordinary have risen ½ to 53s. 9d., upon the issue of a satisfactory report. Substantial savings in expenses have been effected, good orders have been secured abroad, and the position and stability of Callender interests have remained unimpaired. The dividend is 15 per cent. for the thirteenth year in succession, although the profits show a decrease as compared with those in the previous year. The preference shares maintain their 2s. rise at 25s. 9d. Siemens are better at 21s. 3d. upon maintenance of the previously-paid 7½ per cent. dividend for the year. The company's profit of £310,900 is £26,000 down, as compared with 1930. Ever-Ready shares have receded to 21s. 3d., and the premium on the new shares to 9s. 3d. British Insulated have continued their advance, and at 56s. 3d. show 1/16 gain. Henley's also are 1/16 up at 4 15/16. Edison Swan 5 per cent. first debenture stock gained 3 points, rising to 92½. General Electrics are 6d. better at 36s. 3d. The dividend announcement is expected to be made next month, and no little curiosity awaits the declaration. Philips' Incandescent Lamp Works report explains the reduction in the dividend from 6 per cent. to 4 per cent. on the ordinary shares by reference to the loss on exchange and the depressing conditions which prevailed in International goods and money markets.

Miscellaneous Matters

Babcock & Wilcox recovered the dividend deduction, and are quoted at 38s. 9d. xd. It is stated that the company has obtained, through one of its subsidiaries, an important foreign order. The iron, coal and steel market as a whole is dull. Vickers, as an instance, have gone back to 5s. 10½d. The shares are of the nominal value of 6s. 8d. each. The company's 5 per cent. tax free preference shares of £1 each can be bought at 15s. 3d. Nothing of fresh interest has developed in the rubber market.

Atlas ordinary are dull at 8s. 3d. Yorkshire West Riding Trams at 4s. 6d. are 9d. down, but the company's 4½ per cent. debenture shows a gain of 2 points at 60½. An interesting prospectus of the week offered 60,000 £1 shares in the Telsen Electric Company, Limited, at £3 each. The company was started eight years ago with a capital of £50. The current year's profits are estimated at £150,000.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price. May 24.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	60/9	—	4 18 9
Brompton Ordinary	1	8½	8½	28/-	—	5 0 0
Central Electricity 4½% Deb.	Stock	4½	4½	97½	+2	4 12 4
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8½	8½	27/6	+1/-	5 1 10
City of London	1	10	10	37/6	—	5 6 8
Clyde Valley	1	8	7	27/6	—	5 1 10
County of London	1	11	10½	42/6	—	4 18 10
Edmundsons' 7% Pref.	1	7	7	26/6	+6d.	5 5 8
Elec. Dis. Yorkshire	1	9	9	35/-	—	5 2 10
Elec. Supply Corporation	1	11	—	47/6	—	4 12 7
Kensington Ordinary	1	8	8	28/6	—	4 18 3
Lancs. Light and Power	1	6½	7	26/3	—	5 6 8
London & Home Counties 4½% Deb.	Stock	4½	4½	97½	+1	4 12 4
London Electric	1	9	9	28/-	—	5 0 0
Metropolitan	1	10	10	41/3	—	4 17 6
Midland Counties	1	7	7	28/9	—	4 17 5
Mid. Elec. Power	1	8	8	30/6	—	5 5 0
Newcastle-on-Tyne Ordinary	1	6	6	23/9	—	5 1 1
Do. 7% Pref.	1	7	7	27/6	—	5 1 10
Northampton	1	10	10	40/9	—	4 18 2
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	25/-	+6d	4 16 0
St. James' and Pall Mall	1	8	8	28/-	—	5 0 0
Scottish Power	1	8	—	28/3	—	5 13 3
South London	1	8½	8½	28/6	+6d	4 18 3
Urban Ordinary	1	7	—	28/9xd.	+⅛	4 17 5
Westminster Ordinary	1	8½	8½	28/-	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	16/3	—	9 4 8
Yorkshire Elec.	1	8	8	33/9	—	4 14 10
Home Rails.						
Central London Ord. Assented	Stock	4	4	72½	—	5 10 4
Metropolitan	„	4	3½	43½	−1	8 0 11
Do. District	„	5	4½	51½	—	8 14 10
Underground Electric	1	8	7	17/-	—	8 4 8
Telegraphs and Telephones.		1929.	1930.			
American Tel. & Tel.	$100	9	9	130	−5	6 18 6
Anglo-Am. Tel. Pref.	Stock	6	6	97	−½	6 3 9
Do. Def.	„	1½	1½	22	−1	6 16 5
Cables & Wireless 5½% Pref.	„	5½	5½	38½	−3	—
Do. A 7½% Ord.	„	Nil	—	12	−2	—
Do. B Ord.	„	Nil	—	8	−½	—
Globe Tel. and T. Ord.	10	10	8½	4	-½	—
Do. do. Pref.	10	6	6	6½	—	9 4 6
Great Northern Tel.	10	20	20	23	—	8 13 10
Marconi-Marine	1	15	15	23/9	−9d.	8 8 5
Oriental Telephone Ord.	1	12	12	2 5/8 xd.	—	*5 4 0
Home and Foreign Trams, etc.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	3/9	—	—
Do. do. 5% Deb.	Stock	5	5	8	—	—
British Electric Traction Def. Ord.	„	5	5	675	+25	—
Do. do. Pref. Ord.	„	8	8	125½	+4	6 7 6
Brazil Traction	100	8	—	11	−1	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	90½	—	5 11 0
London & Sub. Trac. 5% Pref.	1	Nil	Nil	3/9	—	—
London United Tram Deb.	Stock	4	4	57½	—	6 19 2
Mexico Trams, 5% Bonds	—	5	5	25½	−7	19 12 2
Mexico Light Common	100	Nil	Nil	12½	—	—
Do. 7% Pref.	100	7	7	22½	—	27 9 0
Do. 1st Bonds	—	5	5	54½	−3	9 3 6
Victoria Falls Ord.	1	15	15	57/6	+⅛	5 4 4
Yorkshire (West Riding)	1	Nil	Nil	4/6	−9d.	—
Manufacturing Companies.						
Assoc. Elec. Ord.	1	6	6	16/3	—	4 18 6
Do. Pref.	1	8	8	28/3	—	5 13 3
Babcock & Wilcox	1	15	14	38/9xd.	+9d.	7 4 6
British Aluminium Ord.	1	10	10	21/3	−9d.	4 14 2
British Insulated Ord.	1	15	15	56/3	+⅛	5 6 8
Brush Ord.	Stock	10	5	55	—	9 1 8
Callender's	1	15	15	53/9	+½	5 11 6
Do. 6½% Pref.	1	6½	6½	25/9	—	5 1 0
Crompton Parkinson Ord.	5/-	30	30	17/6	—	8 11 6
Do. 8% Pref.	1	8	8	27/6	—	5 16 5
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	92½	+3	5 8 1
Electric Construction	1	5	Nil	7/6	—	—
Enfield Cable Ord.	1	25	25	3½	—	7 8 2
English Electric	1	Nil	Nil	8/9	—	—
Do. do. Pref.	1	Nil	Nil	10/-	—	—
Ever Ready	5/-	35	35	21/3	−9d.	8 4 8
Ferranti Pref.	1	7	7	22/-	—	6 7 3
G.E.C. Pref.	1	6½	6½	26/-	—	5 0 0
Do. Ord.	1	14	10	36/3	+6d.	5 10 4
Henley's	1	30	30	4 15/16	+1/16	6 1 6
Do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	4/6	—	—
Johnson & Phillips	1	10	10	⅞	—	5 14 3
Siemens Ord.	1	7½	7½	21/3	+1/16	7 1 2
Telegraph Construction	12	10	7½	10	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken

1930

24,712. "Apparatus for the electrical reproduction of marking such as sound or picture records with the aid of light." Gramophone Co., Ltd., H. Neal, and C. O. Browne. June 18th, 1931. (371,952.)

36,981. "Alternating current dynamo electric machines." Electric Construction Co., Ltd., and L. J. Hunt. August 12th, 1931. (371,957.)

38,706. "Systems for varying the resounding and reverberating times in the transmission and registration of sound." Klangfilm Ges. December 23rd, 1929. (371,830.)

1931

1,592. "Temperature controlled electric switch." J. C. Halford. October 13th, 1931. (371,961.)

1,913. "Picture telegraph and television systems." Telefunken Ges. für Drahtlose Telegraphie. January 20th, 1930. (371,832.)

2,051. "Apparatus for testing high-power electrical equipment." Siemens-Schuckertwerke Akt.-Ges. April 15th, 1930. (371,855.)

2,097. "Electric torque motors such as for braking systems of electrically driven road vehicles." G. H. Fletcher and Associated Electrical Industries, Ltd. January 21st, 1931. (371,913.)

2,133. "Electric switchgear." F. B. Cox. January 22nd, 1931. (371,856.)

2,189. "Overhead electric conductors for vehicles." Akt. Ges. Brown, Boverie & Cie. January 22nd, 1930. (371,858.)

2,209. "Process for initiating and maintaining high tension currents in gas purifying apparatus." Siemens-Schuckertwerke Akt.-Ges. January 23rd, 1930. (371,859.)

2,304. "Telegraph exchange systems." Siemens & Halske Akt.-Ges. January 25th, 1930. (371,861.)

2,442. "Electric purification of liquids." Dr. J. Billiter. January 27th, 1930. (371,837.)

2,541. "Thermionic valve oscillation generators." H. L. Kirke and J. McLaren. January 25th, 1931. (371,863.)

2,664. "Interconnecting arrangements for use in telephone exchanges." Associated Telephone & Telegraph Co. February 17th, 1930. (371,843.)

2,665. "Control boards for electric power networks." Associated Telephone & Telegraph Co. February 1st, 1930. (371,844.)

2,677. "Means for securing the secrecy of electrically transmitted intelligence signals and the like." Siemens & Halske Akt.-Ges. February 28th, 1930. (371,845.)

2,683. "Synchronously rotating distributors." Electrical Research Products Inc. February 24th, 1930. (371,847.)

2,703. "Means for dissipating heat generated in electrical apparatus immersed in liquid." British Electric Transformer Co., Ltd., and L. Clarke. January 27th, 1931. (371,926.)

2,803. "Electric signalling systems." Siemens Bros. & Co., Ltd., and D. A. Christian. January 28th, 1931. (371,930.)

2,891. "Carrier current signalling systems." Standard Telephones & Cables, Ltd. January 30th, 1930. (371,885.)

2,892. "Automatic or semi-automatic telephone systems." Standard Telephones & Cables, Ltd., and E. P. G. Wright. January 29th, 1931. (371,886.)

2,894. "Vacuum tube amplifiers." Standard Telephones & Cables, Ltd. March 26th, 1930. (Addition to 317,005.) (371,887.)

2,929. "Control boards for electric power networks." Associated Telephone & Telegraph Co. February 13th, 1930 (Patent of addition not granted.) (371,890.)

2,930. "Overload responsive switches." British Thomson-Houston Co., Ltd., and H. C. Heath. January 29th, 1931. (Addition to 298,549.) (371,891.)

2,946. "Shielding devices for electrical ignition systems." Wright Aeronautical Corporation. July 31st, 1930. (371,892.)

3,084. "Loading coils for telephone lines." Automatic Electric Co., Ltd., C. Rhodes, and J. H. Phillips. January 30th, 1931. (371,937.)

3,086. "Electric potential dividers." F. P. Burch and Associated Electrical Industries, Ltd. January 30th, 1931. (371,938.)

3,087. "Electric potential dividers." F. P. Burch and Associated Electrical Industries, Ltd. January 30th, 1931. (371,939.)

3,241. "Electric cutouts." Appareillage Gardy Soc. Anon. February 1st, 1930. (371,949.)

3,654. "Electric signalling systems." Standard Telephones & Cables, Ltd., and J. B. Griffiths. February 5th, 1931. (371,964.)

3,699. "Apparatus for screening thermionic valves and the like." Six-Sixty Radio Co., Ltd., and D. P. Wheeldon. February 5th, 1931. (371,967.)

3,774. "Braking control of electrically driven vehicles." S. S. Guy. February 6th, 1931. (371,972.)

3,972. "Electro-magnetic pick-ups for gramophones and the like." E. E. Rosen and J. Sarche. February 7th, 1931. (371,975.)

4,312. "Electric bells." Asahi Kandenchi Kabushiki-Kaisha and R. Oshima. February 11th, 1931. (371,977.)

4,994. "Electromagnetically operated mechanisms." Siemens Bros. & Co., Ltd., and F. Baker. February 17th, 1931. (371,989.)

5,170. "Method of and apparatus for street lighting." Holophane, Ltd., and S. English. February 18th, 1931. (371,991.)

5,290. "Electric discharge tubes." M-O Valve Co., Ltd., C. G. Eden, and C J. Smithells. February 19th, 1931. (371,992.)

5,771. "Position indicator for elevators." Waygood-Otis, Ltd. (Otis Elevator Co.) February 24th, 1931. (372,000.)

5,895. "Telephone systems." Siemens Bros. & Co., Ltd., and W. H. Grinsted. February 25th, 1931. (372,004.)

7,612. "Electric cables containing loading coils." Siemens Bros. & Co., Ltd., and H. G. Wood. March 12th, 1931. (372,020.)

7,888. "Wireless aerials or antennæ." J. W. Carwin and J. J. Bispham. March 14th, 1931. (372,023.)

7,922. "Electrical switchgear." G. E. Whitehead and Whitehead's Electrical Inventions, Ltd. March 14th, 1931. (372,027.)

9,272. "Method of and means for supplying high tension electric current to the emission electrodes of purifying chambers in electric gas-purifying plant." Siemens-Schuckertwerke Akt.-Ges. March 27th, 1930. (372,047.)

9,459. "Thermally released overload circuit-breakers." Emag Elektrizitats-Akt. Ges. and P. Heilmann. March 28th, 1931. (372,051.)

10,118. "Means for mounting electric lamps." Callender's Cable & Construction Co., Ltd., and A. E. Wilson. April 2nd, 1931. (372,060.)

10,254. "Electric cable joints." Siemens Bros. & Co., Ltd., and J. Riedl. April 7th, 1931. (372,063.)

10,530. "Telephone systems." Telefonaktiebolaget L. M. Ericsson, T. A. Lundell, and T. Laurent April 9th, 1931. (372,066.)

10,648. "Electric signal amplifiers." British Thomson-Houston Co., Ltd. April 10th, 1930. (372,069.)

11,799. "Controlling mechanism for electric motors." O. M. Poock. June 11th, 1930. (372,078.)

11,953. "Methods of manufacturing mercury-vapour filled electron tubes." Telefunken Ges. für Drahtlose Telegraphie. April 22nd, 1930. (372,080.)

12,660. "High frequency signalling." Soc. Francaise Radio-Electrique. May 6th, 1930. (Addition to 270,749.) (372,090.)

13,007. "Electrically operated smokers' ignition devices." V. J. S. Russell and S. Smith & Sons (Motor Accessories), Ltd. May 2nd, 1931. (372,093.)

13,510. "Electric heating elements." Ferranti, Ltd., and W. V. Butterfield. May 7th, 1931. (372,095.)

13,701. "Process for introducing and maintaining high tension currents in gas testing apparatus." Siemens-Schuckertwerke Akt.-Ges. May 12th, 1930. (Addition 2,209/31.) (372,097.)

14,753. "Magazine switch fuses." English Electric Co., Ltd., and C. Hollander. May 19th, 1931. (372,109.)

15,633. "Electromagnetic relays." Westinghouse Electric & Manufacturing Co. June 16th, 1930. (372,117.)

16,416. "Apparatus for connecting a source of acoustic waves with several listeners for a suitable time." Holding Internationale. June 7th, 1930. (372,125.)

18,195. "Holders for electric lamp bulbs." W. S. Thimblethorpe. June 23rd, 1931. (372,140.)

19,408. "Indirectly heated cathodes for electric discharge tubes." Allgemeine Elektricitäts Ges. July 4th, 1930. (372,152.)

19,577. "Luminous electric discharge tubes." General Electric Co., Ltd. August 21st, 1930. (372,154.)

19,594. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. July 7th, 1930. (372,155.)

20,149. "Induction motors." Westinghouse Electric & Manufacturing Co. September 22nd, 1930. (372,164.)

20,251. "Electric coupling systems for thermionic valve circuits." Hazeltine Corp. August 20th, 1930. (371,697.)

20,839. "Television, the transmission of moving pictures and like receiving devices." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. October 31st, 1930. (Addition to 364,376.) (372,168.)

20,859. "Joints for high tension electric cables." Soc. Italiana Pirelli. October 30th, 1930. (372,169.)

21,232. "Means for supporting resistor elements in electrically heated furnaces or like chambers." Electric Resistance Furnace Co., Ltd., and F. G. Connor. July 24th, 1931. (371,708.)

21,751. "Device for fastening electrical apparatus, more especially time switches, in their casing." Landis & Gyr Soc. Anon. August 2nd, 1930. (371,718.)

22,471. "Magneto-electric machines." R. Bosch Akt.-Ges. August 29th, 1930. (372,187.)

23,633. "Flywheel ignition magnetos for internal combustion engines." R. Bosch Akt.-Ges. August 29th, 1930. (372,199.)

24,021. "Electric power converting apparatus." British Thomson-Houston Co., Ltd. August 27th, 1930. (372,202.)

24,558. "Electric power converting apparatus." British Thomson-Houston Co., Ltd. September 2nd, 1930. (371,734.)

24,752. "Photo-electric apparatus." Westinghouse Electric & Manufacturing Co. September 6th, 1930. (371,736.)

25,378. "Electric lampholders." J. B. Tucker. September 10th, 1931. (371,743.)

25,957. "High-power short-wave transmitting apparatus, particularly such apparatus employing thermionic valves." C. Lorenz Akt.-Ges. November 5th, 1930. (372,212.)

30,583. "Electric cooking apparatus." General Electric Co., Ltd., O. W. Humphreys, and C. W. Stopford. November 4th, 1931. (371,769.)

30,583. "Telephone systems." Automatic Electric Co., Ltd., and R. Taylor. January 19th, 1931. (Divided application on 371,355.) (371,358.)

32,463. "Apparatus for inspection and radiographic photography of the body." A. C. Gunstone. November 23rd, 1931. (371,775.)

33,358. "Electric sound warning devices." R. Bosch Akt.-Ges. December 12th, 1930. (Addition to 356,535.) (371,781.)

1932

2,591. "Construction of earth device for wireless apparatus." J. W. Spong. January 28th, 1932. (Addition to 6,563/31.) (372,257.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 18th:—

Rockbestos. No. 525,297. All goods in Class 8. No. 525,298. Class 50. Electrical insulating materials composed wholly or principally of asbestos, and wire covered with asbestos or with a composition material consisting principally of asbestos.—British Insulated Cables, Ltd., Prescot, Lancs.

Aidas. No. 529,590. Class 8. Ammeters, electric induction coils, time switches, fitted electrical switchboards, electric meters, flashlight signalling apparatus, power meters and indicators, speed indicators and gauges, telegraphic and telephonic instruments, testing instruments (electrical), time registering apparatus and voltmeters.—Aidas Electric, Ltd., Aidas Works, St. Leonard's Road, Willesden Junction, N.W.10.

Lamalac (lettering and design). No. 530,297. Class 50. Electrical insulating material composed of paper coated or impregnated with synthetic or natural resin.—Mica & Micanite Supplies, Ltd., Capel House, 54, New Broad Street, E.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Houses (70), Wales Farm Estate (£24,181); H. H. and H. H. Audrey, Colindale, Hendon. Factories for Amri Co., Ltd., Pahl Bros., Ltd., Porcella Products, Ltd., and bank for Lloyds Bank, Park Royal Road, &c.; F. E. Simpkins, architect, Park Royal Road. Additions to St. Vincent's School, Rosemont Road; G. P. Pratt, architect, High Street.

Aylesbury (BUCKS).—Houses (20), Tring Road, for Janes and Co. Extensions, Institution (£10,290), for the Bucks P.A.C.; Fleet & Roberts, builders.

Barnsley.—Medical services clinic (£10,700); borough engineer.

Bedford.—Additions to 86-8, High Street; S. Foster, Ltd. Labour exchange for H.M. Office of Works, King Charles Street, S.W.1. Alterations and additions to the Sydney Press, Sydney Road; I. Daughtry.

Bexley (KENT).—Houses (44), The Drive, Blendon Hall, for D. C. Bowyer. Houses (122), Grosvenor Road and Olron Crescent, for Kent Construction Co., Ltd. Bank, Bellegrove Road; Barclays Bank, Ltd.

Billingham-on-Tees (DURHAM).—Nursing home; Kitching and Co., architects, 21, Albert Road, Middlesbrough.

Bilston (STAFFS).—Stores and bazaar, Church Street, for Marks and Spencer, Ltd., Michael House, 72-82, Baker Street, W.1; Bovis, Ltd., 35, High Street, builders, St. Marylebone, London, N.W.

Birmingham.—Additions to premises of Hawkes & Snow, Ltd., Priory Works, Stratford Road, Shirley.

Blackpool.—Shopping centre, arcade and flats. Promenade, for Mrs. H. Hall; H. Best, architect, Leeds Buildings, 20, Clifton Street.

Blantyre.—Houses (62) for Lanarkshire C.C.; Wright & Sons, builders.

Blaydon-on-Tyne.—Houses (42), Highfield; Tindle & Co., builders, Rowlands Gill. Houses on Axwell Estate; E. R. Davison, builders.

Bolton.—Extensions to garage, Ship Gates, for Tillotson's Newspaper, Ltd., Mealhouse Lane; J. & N. Dickinson (1922), Ltd., builders, 37, St. George's Road.

Bradford.—Central premises, Sunbridge Road, for the Co-operative Society, Ltd. (£15,000); Architects' Dept., C.W.S., Ltd., Balloon Street, Manchester. Sewage disposal works, Esholt; H. Wonter Smith, Esholt Hall, near Shipley.

Bridgnorth (SALOP).—Carpet works extensions, for H. & M. Southwell, Ltd.

Bristol.—Conversion of Wick Road Girls' School into senior boys' school (£7,194), for the E.C.

Burslem (STAFFS).—Workshops, Podmore Street; J. MacIntyre & Co., Ltd.

Campden (GLOS).—Houses (26); R.D.C. surveyor.

Canterbury.—Estate development, near Whitstable Road; Ecclesiastical Commissioners.

Carlisle.—Dairy; C.W.S. Building Dept., West Blandford Street, Newcastle-on-Tyne.

Cheshire.—Admission hospital and villas (500 patients), Parkside Mental Hospital, Macclesfield, for the C.C.; clerk, Chester.

Croydon.—Houses (47), South Way; J. Cronk & Sons, Ltd., Spring Farm Estate. Improvements to Scarbrook Road baths (£5,750); borough engineer.

Cumnock (AYRSHIRE).—Houses (56); burgh surveyor. Business stores, for Auchinleck Co-operative Society, Ltd.; W. F. Valentine, architect, Kilmarnock.

Darlington.—Houses (24); borough surveyor. Alterations and additions to the Royal Oak Hotel; Mr. Evans, builder.

Ditton (KENT).—Houses (26); Malling R.D.C., surveyor.

Dumfries.—Greyhound racing track for a syndicate; M. F. Wolffe, secretary, 67, Queen Street.

Durham.—Alterations and additions to High Felling Council School, for the E.C.; W. E. Hall & Sons, builders, 29, Durham Road, Gateshead.

Eastbourne.—Ice rink, Devonshire Park; C. Langdon and S. W. Tomkins.

Edinburgh.—Totalisator boxes, Stenhouse mills and Sauchton mills; A. L. Goodwin, architect, 34, Castle Street. Extension of Stenhouse School (£11,000); city architect.

Essex.—Six schools (£6,752 each). South Essex, for the County E.C.; director of education, Chelmsford.

Exeter.—Flats, Rack Street; city architect.

Gainsborough.—Mill extensions, for Whittons, Ltd.

Gateshead-on-Tyne.—Houses (113), Shipcote Lane; W. E. Hall & Sons, builders, Low Fell.

Glossop (DERBYSHIRE).—Houses (80), Ashes Lane, for S. Goddard & Sons, The Ashes.

Golborne (LANCS).—Houses (56); U.D.C. surveyor.

Gosport.—St. Faith's Church, Lee-on-Solent (£10,600); John Hunt, Ltd., builders.

Grimsby.—Public baths with laundry, &c. (£30,000); borough engineer.

Hampshire.—Children's homes (£30,000), Portsmouth, for the P.A.C.; clerk, Winchester.

Hanley.—Re-erection, Grand Theatre (£30,000); G. H. Barrasford, manager.

Holland (LINCS).—Conversion of Harmston Hall into mental defectives' institution (£12,000); clerk, Boston.

Hyde (CHESHIRE).—Extensions to works for B. W. Wood, Ltd., Broomstair Mill, Denton; T. Warrington, builders, 51, Bennett Street.

Inverness.—Church and hall, Castle Street (£4,000); Stewart and Paterson, architects, Glasgow. Nurses' home (£28,500), and sanatorium (£5,000), for the District Asylum Joint Committee; Alistair Ross, architect.

Isle of Thanet.—Heating improvements, Poor Law Institution (£9,600); Kent county architect, Maidstone.

Keighley (YORKS).—Additions, Chesham Mills; J. Hartley, architects, Swadford Chambers, Skipton.

Kent.—Cottage homes, Cheriton (£3,650), nursery, Medway Cottage Homes, Chatham; laundry and central heating system, Pembury (£24,000); and mental defectives' colony, Leybourne Grange (£88,122), for the P.A.C.; clerk, Maidstone. Premises for Simon Langton Girls' School, Canterbury; county architect, Maidstone.

Knowle (BIRMINGHAM).—Congregational church (£3,900); trustees' secretary.

Lichfield.—Houses (20); borough surveyor. Rabbit farm, Elmhurst (electrically equipped), for Paton & Baldwins, Ltd., Halifax.

Liverpool.—Extensions to the works for Hovis, Ltd., Union Mills, Macclesfield; F. Fowler, architect, Westminster Bank Chambers, Macclesfield.

London.—(BATTERSEA).—Flats, St. John's College Estate, for the B.C. (3rd block); Mr. Dresden, borough surveyor. (BERMONDSEY).—Refinery house, for W. B. Dick & Co., Ltd., Lavender Wharf; R. G. Muir, architect, Raymond Buildings, W.C. (BROCKLEY).—Housing scheme for the C.C. School, Dockhead; Rev. T. Fitzpatrick, 1, Parker's Row, Dockhead, S.E.1. (FULHAM).—Extensions to Appliance Works, Eastcourt Road; G. Garner. (TOTTENHAM).—Estate development, Cleveland Road; A. & S. Faux. Estate development, Risley Avenue; F. Hawes. Telephone exchange, Seven Sisters Road; Office of Works. Infants' school, The Green; Rev. R. A. Courthope.

Lowestoft.—Houses (100), Church Road; Councillor Mobbs.

Maidstone.—Houses, near Farleigh Lane; H. G. Pearce & Sons, Mill Street.

Manchester.—Additions to Mercantile Bank, corner of Mosley Street, for Martin's Bank, Ltd.; G. MacFarlane & Sons, Ltd., builders, New York Street. Additions to works, Earl Street and Grey Street, Ardwick, for J. Yates, Ltd.; T. Warrington, builders, Bennett Street, Hyde. Extensions to Institution for Board of Management of the Home for Aged and Needy Jews; J. Gerrard & Sons, Ltd., builders, Swinton.

Middlesbrough.—Dairy, Grove Hill; C.W.S. Architects' Department, Westmorland Road, Newcastle.

Moreton-in-Marsh (GLOS).—Milk depot for Retail Dairymen's Mutual, Ltd.; H. A. Wright, architect, 35, Pentonville Road, London, N.

New Malden (SURREY).—St. James' Church (£12,000); Rev. G. M. Longsdon.

Northampton.—Hospital, Daventry, for P.A.C.; G. H. Lewin, architect, Guildhall Road. Elementary school, Broughton, Kettering, for C.C.; J. T. Blackwell, architect, Gold Street Chambers, Gold Street, Kettering.

North Shields.—Alterations to Ellis & Son's premises, Nile Street; G. A. Leck, builder.

North Walsham (NORFOLK).—Houses (24) for U.D.C.; A. G. Stackwood, builder, Aylsham.

Oldham.—Extensions to the mental wards at the Institution, Rochdale Road; C. T. Taylor, Roberts & Bowman, architects, 10, Clegg Street.

Paignton.—Shop, Victoria Street; F. W. Woolworth & Co., Ltd. Extensions to Esplanade Hotel; T. R. Willcocks.

Romiley (CHESHIRE).—R.C. church (£4,000); Rev. O. Calderbank, Presbytery, Gorsey Brow.

Rotherham.—Conversion of premises, Albion Road, into club headquarters, for the British Legion and United Services; W. J. Denham, architect, 21, Albany Street.

Rugby.—Bazaar stores, 17 and 18, High Street, for Marks & Spencer, Ltd., 21, Chiswell Street, London, E.C.

Scarborough.—Houses for aged people, Northstead; H. W. Smith, borough surveyor, Town Hall. Extensions to Swift & Co.'s factory; R. A. Sowersby, builder.

Southend - on - Sea. — Pier promenade, Westcliff-on-Sea (£400,000), for T.C.

Stockport.—Additional ward and operating theatre at the Institution (£5,475); T. Worthington & Sons, architects, 176, Oxford Road, Manchester.

Stocksfield-on-Tyne.—Dairy; C.W.S. Architects' Department, 90, Westmorland Road, Newcastle-on-Tyne.

Stoke-on-Trent.—Estate development off London Road, Trent Vale; Mr. Gotham, architect.

Sunderland.—R.C. school; Rev. G. Wheatley, St. Joseph's Church, King's Road, Millfield.

Swanage (DORSET).—Housing scheme; U.D.C. surveyor.

Swansea.—Houses (90), Carnglas Estate; T. & G. Spragg. Houses (100), Mayhill Estate; borough architect.

Swindon (WILTS).—Houses (150); borough surveyor.

Tunstall (STAFFS).—St. Chad's Church; Rev. J. O. Nicholls.

Twickenham.—Shops and flats, Heath Road, for the Bagley Estate, Ltd.; Gale, Heath & Sneath, 15, New Bridge Street, E.C.4. Rehousing scheme for C.C., Ernscroft Estate (£35,865); E. Clark & Son, builders, Melton Mowbray.

Tynemouth.—Alterations and additions to the Moor Park Hospital; J. L. Beckett, borough surveyor, Town Hall.

Upholland (LANCS).—Houses (58); U.D.C. surveyor.

Walsall.—Houses (45); borough surveyor.

Wealdstone (MIDDLESEX).—Houses (85), Grove Park Avenue; Hilbery Chaplin, Ltd. Extensions to Reno Works, Rosslyn Crescent; W. Horton (Toys), Ltd.

Wellingborough (NORTHANTS).—Shops, Oxford Street; F. Ireson & Sons, builders, Park Road.

Whickham-on-Tyne.—Alterations and improvements to the War Memorial Cottage Hospital (£2,500); Mr. Stephenson, architect, Beechgrove.

Whitley Bay.—Development of Brierdene Estate (£250,000); J. C. Brewis, G. C. Hadden, Walker-on-Tyne; and S. Mather, builders.

Wimbledon.—Shops, Wimbledon Station Bridge; Southern Railway Co.

Wood Green.—Estate development, Passmore Gardens, for G. G. Tucker; F. F. Tomlin.